STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
401 CHURCH STREET
L & C ANNEX 6TH FLOOR
NASHVILLE TN 37243-1534

August 20, 2007

Mr. Johnny O. Moore
Assistant Manager for Science
United States Department of Energy
Oak Ridge National Laboratory
P.O. Box 2001
Oak Ridge, TN 37831

Subject: **Draft of NPDES Permit No. TN0002941**
USDOE-Oak Ridge National Laboratory
Oak Ridge, Roane County, Tennessee

Dear Mr. Moore:

Enclosed please find a draft copy of the NPDES permit which the Division of Water Pollution Control (the division) proposes to issue. This draft copy is furnished to you solely for your review of its provisions. This permit authorizes no wastewater discharges. The issuance of an official permit is contingent upon your meeting all of the requirements of the Tennessee Water Quality Control Act and the Rules and Regulations of the Tennessee Water Quality Control Board.

Also enclosed is a copy of the public notice that announces our intent to issue this permit. The notice affords the public an opportunity to review the draft permit and, if necessary, request a public hearing on this issuance process. If you disagree with the provisions and requirements contained in the draft permit, you have twenty-five (25) days from the date of this correspondence to notify the division of your objections. If your objections cannot be resolved, you may appeal this permit upon issuance. This appeal should be filed in accordance with Section 69-3-110 of the Tennessee Code Annotated.

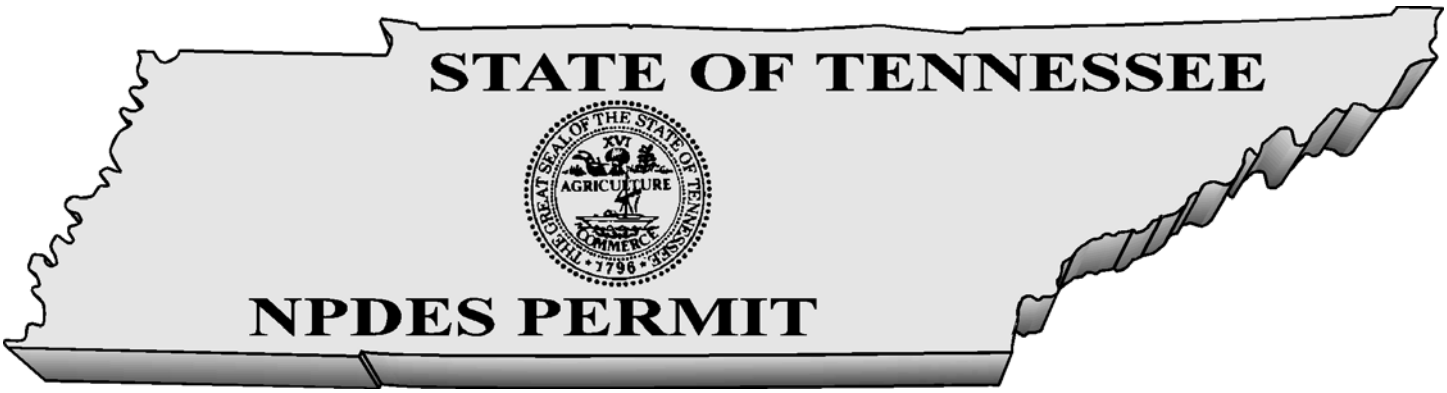
If you have questions, please contact the division at the Knoxville Environmental Field Office at 1-888-891-TDEC; or, at this office, please contact Mr. Bob Alexander at (615) 532-0659 or by E-mail at *Robert.Alexander@state.tn.us*.

Sincerely,

Edward M. Polk, Jr., P.E.
Manager, Permit Section
Division of Water Pollution Control

P/WAT-3
Enclosure

cc: DWPC, Permit Section & Knoxville Environmental Field Office
Mr. David L. Buhaly Environmental Program Manager, USDOE ORNL Site Office, PO Box 2008, Oak Ridge, TN 37831
ConnieA. Kagey, EPA Region IV, Sam Nunn Atlanta Federal Center, NPDES Permit Section, 61 Forsyth Street SW, Atlanta, GA 30303



No. TN0002941

Authorization to discharge under the
National Pollutant Discharge Elimination System (NPDES)

Issued By
Tennessee Department of Environment and Conservation
Division of Water Pollution Control
401 Church Street
6th Floor, L & C Annex
Nashville, Tennessee 37243

Under authority of the Tennessee Water Quality Control Act of 1977 (T.C.A. 69-3-101 et seq.) and the delegation of authority from the United States Environmental Protection Agency under the Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977 (33 U.S.C. 1251, et seq.)

Discharger:	**USDOE-Oak Ridge National Laboratory**
is authorized to discharge:	**process wastewaters and other wastewaters which have been accepted for discharge via waste acceptance procedures or best management practices, facility wastewaters including cooling tower blowdown; cooling waters; condensate; sump waters; storm water runoff and ground water**
from a facility located:	**in Oak Ridge, Anderson and Roane Counties, Tennessee**
to receiving waters named:	**White Oak Creek and its tributaries and tributaries to Clinch River**

in accordance with effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall become effective on:

This permit shall expire on:

Issuance date:

Paul E. Davis, Director
Division of Water Pollution Control

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PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

USDOE-Oak Ridge National Laboratory is authorized to discharge treated wastewater from sources including but not limited to sanitary sewage that are conducive to biological treatment through Outfall X01 to White Oak Creek. These discharges shall be limited and monitored by the permittee as specified below:

TREATED DOMESTIC WASTEWATER

OUTFALL X01 - SEWAGE TREATMENT PLANT

	EFFLUENT LIMITATIONS				MONITORING REQUIREMENTS	
	MONTHLY		DAILY			
EFFLUENT CHARACTERISTIC	AVG. CONC. (mg/l)*	AVG. AMT. (lb/day)	MAX. CONC. (mg/l)*	MAX. AMT. (lb/day)	MSRMNT. FRQNCY.	SAMPLE TYPE
Flow		report		report	3/week	recorder
pH		range 6.0-9.0			weekly	grab
Total suspended solids	30.0	57.5	45.0	86.3	weekly	composite
CBOD5	10.0	19.2	15.0	28.8	weekly	composite
Ammonia, (as N) Summer**	2.50	6.26	3.75	9.39	weekly	composite
Ammonia, (as N) Winter**	5.25	13.14	7.90	19.78	weekly	composite
HEM (Hex. Extr. Matls)	10	19.2	15.0	28.8	monthly	grab
Dissolved Oxygen	Min. 6.0				weekly	grab
E. COLI	126		941		weekly	grab
Gross alpha	report				monthly	composite
Gross beta	report				monthly	composite
IC25	survival, reproduction, growth in 15.5% effluent				2/yearly	composite
48 hour LC_{50}	survival in 69.4 % effluent				2/yearly	composite
TOTAL PHOSPHORUS			report		quarterly	composite
Total Nitrogen TKN			report		quarterly	composite
Total MERCURY			report		2/ monthly	composite
METHYL MERCURY			report		2/ monthly	grab
TOTAL PCBs			report		quarterly	composite

Outfall monitoring requirements for total and methyl mercury will be re-evaluated at the end of one (1) year.

E. COLI. MONITORING AT OUTFALL X01

The wastewater discharge must be disinfected to the extent that viable coliform organisms are effectively eliminated. The concentration of the E. coli group after disinfection shall not exceed 126 cfu per 100 ml as the geometric mean calculated on the actual number of samples collected and tested for E. coli within the required reporting period. For the purpose of determining the geometric mean, individual samples having an E. coli group concentration of less than one (1) per 100 ml shall be considered as having a concentration of one (1) per 100 ml.

The USDOE is authorized to discharge treated effluent from sources which are conducive to treatment in the Steam Plant Wastewater Treatment Facility (SPWTF), including but not limited, to boiler blowdown and water softener regenerant, through Outfall X02 to White Oak Creek. These discharges shall be limited and monitored by the permittee as specified below:

TREATED PROCESS WASTEWATER

OUTFALL X02 STEAM PLANT WASTEWATER TREATMENT FACILITY

	EFFLUENT LIMITATIONS				MONITORING REQUIREMENTS	
	MONTHLY		DAILY			
EFFLUENT CHARACTERISTIC	AVG. CONC. (mg/l)*	AVG. AMT. (lb/day)	MAX. CONC. (mg/l)*	MAX. AMT. (lb/day)	MSRMNT. FRQNCY.	SAMPLE TYPE
Flow		report		report	daily (workday)	recorder
pH		range 6.0-9.0			weekly**	grab
Total suspended solids			50.0		ONCE 2 MO'S.	composite
Gross alpha	report				monthly	monthly composite
Gross beta	report				monthly	monthly composite
CONDUCTIVITY			report		weekly**	grab

* Units will vary from mg/l for some reportable compounds.

* * During a discharge. See Rationale for discussion of relationship of TDS and conductivity.

The USDOE is authorized to discharge treated effluent through Outfall X12 to White Oak Creek from sources including but not limited to process wastewaters conducive to removal of metals and organics. These discharges shall be limited and monitored by the permittee as specified below:

TREATED PROCESS WASTEWATER

OUTFALL X12 PROCESS WASTE TREATMENT COMPLEX

	EFFLUENT LIMITATIONS				MONITORING REQUIREMENTS	
	MONTHLY		DAILY			
EFFLUENT CHARACTERISTIC	AVG. CONC. (mg/l)*	AVG. AMT. (lb/day)	MAX. CONC. (mg/l)*	MAX. AMT. (lb/day)	MSRMNT. FRQNCY.	SAMPLE TYPE
Flow		report		report	daily	recorder
Temperature	30.5 deg C.				weekly	grab
Total suspended solids			report		quarterly	composite
pH	range 6.0-9.0				monthly	grab
Total toxic organics			report	report	Annually	grab
HEM (form. Oil and Grease)	10	67	15.0	100	monthly	grab
Gross alpha	report				monthly	monthly composite
Gross beta	report				monthly	montlhly composite
Cyanide, total	0.008	4.33	0.046	8.00	2/year	grab
Arsenic, total	0.007		0.014		1/2 months	composite
Cadmium, total	0.003	1.73	0.026	4.60	1/2 months	composite
Chromium, total	0.220	11.40	0.44	18.46	1/2 months	composite
Copper, total	0.070	13.80	0.11	22.53	1/2 months	composite
Lead, total	0.028	2.87	0.69	4.60	1/2 months	composite
Mercury, total	report		report		2/month	composite
48 hour LC_{50}	survival in 100% effluent				2/year	composite
IC25	survival, reproduction, growth in 30.5% effluent				2/year	composite
Methyl Mercury	report		report		2/month	grab

* Units will vary from mg/l for some reportable compounds.

Outfall monitoring requirements for total and methyl mercury will be re-evaluated at the end of one (1) year.

USDOE shall monitor for total residual oxidant at in-stream monitoring stations as listed below:

INTERNAL MONITORING PONTS

INSTREAM CHLORINE MONITORING POINTS

X16 & X17 - First Creek

X18, X19, X20 - Fifth Creek

X21, X22, X23, X24, X25, and X26 - White Oak Creek

X27 - Melton Branch

	MONTHLY		DAILY		MONITORING REQUIREMENTS	
EFFLUENT CHARACTERISTIC	AVG. CONC. (mg/l)	AVG. AMT. (lb/day)	MAX. CONC. (mg/l)	MAX. AMT. (lb/day)	MSRMNT. FRQNCY.	SAMPLE TYPE (NOTE 1)
Temperature	report		report		2/month	grab
pH	report maximum and minimum				2/month	grab
Total Residual Oxidant	0.011		0.019		2/month	grab

Monitoring shall be performed during non-storm flow conditions where possible. A description of the flow observed during sampling conditions shall be kept with the sampling records.

B. CATEGORY OUTFALLS

The United States Department of Energy, Oak Ridge National Laboratory, is authorized to discharge stormwater, cooling water, cooling tower blowdown, condensate, groundwater, other facility wastewaters, and other wastewaters managed under best management practices through the following category outfalls. Monitoring of category outfalls will be established in the Water Quality Protection Plan under Part IV of this permit.

001, 004, 005, 006, 009, 010, 011, 014, 016, 017, 021, 031, 033, 041, 043, 051, 052, 053, 054, 055, 056, 057, 058, 064, 065, 070, 081, 084, 085, 091, 101, 102, 104, 106, 107, 108, 111, 113, 114, 141, 142, 161, 162, 164, 165, 166, 168, 169, 170, 171, 191, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 216, 217, 218, 219, 220, 221, 222, 223, 224, 226, 227, 230, 231, 232, 234, 235, 241, 243, 245, 247, 249, 250, 261, 262, 263, 264, 265, 266, 267, 268, 269, 281, 284, 291, 301, 302, 304, 310, 311, 312, 313, 314, 341, 342, 343, 361, 362, 363, 364, 365, 367, 368, 383, 403, 431, 432, 433, 434, 435, 436, 437, 443, 447, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490

C. ADDITIONAL MONITORING REQUIREMENTS AND CONDITIONS APPLICABLE TO ALL OUTFALLS

There shall be no distinctly visible solids, scum, foam, oily slick, or the formation of slimes, bottom deposits, or sludge banks of such size or character as to impair the usefulness of the receiving water's designated uses as set forth in Tennessee Rule 1200-4-3 and 1200-4-4.

The wastewater discharge shall not contain pollutants in quantities that will be hazardous or otherwise detrimental to humans, livestock, wildlife, plant life, or fish and aquatic life in the receiving stream.

Sludge or any other material removed by any treatment works must be disposed of in a manner which prevents its entrance into or pollution of any surface or subsurface waters. Additionally, the disposal of such sludge or other material must be in compliance with the Tennessee Solid Waste Disposal Act, TCA 68-31-101 et seq. and the Tennessee Hazardous Waste Management Act, TCA 68-46-101 et seq.

For the purpose of evaluating compliance with the permit limits established herein, where certain limits are below the most sensitive test method published in 40 CFR 136 and below the State of Tennessee published required detection levels (RDLs) for any given effluent characteristics, the results of analyses below the RDL shall be reported as Below Detection Level (BDL), unless in specific cases other detection limits are demonstrated to be the best achievable because of the particular nature of the wastewater being analyzed. Analytical results reported as "BDL" are considered to be in compliance with the permit, provided the method quantitation limit achieved is equal to or less than the RDL specified in Chapter 1200-4-3-.05(8) and less than the method .quantitation limit for the most sensitive method published in 40 CFR 136.

D. MONITORING PROCEDURES

1. Representative Sampling

Samples and measurements taken in compliance with the monitoring requirements specified above shall be representative of the volume and nature of the monitored discharges. Treated wastewaters, cooling waters and other non-storm water effluents from outfalls shall be sampled after treatment and prior to mixing with the receiving waters. Where outfalls cannot be sampled at the discharge point because of being submerged in high waters or for safety reasons, sampling for that outfall may be conducted at a point further up the conveyance or at another point representative of the discharge. Sampling for non-storm water discharges should be made when storm water flow is not present as part of the discharge.

Storm water sampling shall be made as designated in the Water Quality Protection Plan which is approved by the Division. Monitoring in waters of the State shall be representative of the waters being monitored.

Where parameters are below detection limits, determination of compliance with daily maximum limitations will be assumed when analyses are below detection where the daily maximum limit is below the detection limit as well. A zero will be used in place of all values that are below the detection level for the computing averages for compliance purposes. Analyses must meet a detection level recognized by the Division of Water Pollution Control.

2. Sampling Frequency

For outfalls with a daily monitoring requirement, if there is a discharge from a permitted outfall on any given day during the monitoring period, the permittee must sample and report the results of analyses accordingly, and the permittee should not mark the 'No Discharge' box on the Discharge Monitoring Report form.

Where the permit requires sampling and monitoring of a particular effluent characteristic(s) at a frequency of less than once per day or daily, the permittee is precluded from marking the "No Discharge" block on the Discharge Monitoring

Report if there has been any discharge from that particular outfall during the period which coincides with the required monitoring frequency, i.e. if the required monitoring frequency is once per month or 1/month, the monitoring period is one month, and if the discharge occurs during only one day in that period then the permittee must sample on that day and report the results of analyses accordingly

The permittee should mark the 'No Discharge' box on the Discharge Monitoring Report form only if a permitted outfall does not discharge at any time during the monitoring period. If the outfall discharges effluent at any time during the monitoring period, the permittee must provide at least one sampling result from the effluent of that outfall.

3. Test Procedures

a. Test procedures for the analysis of pollutants shall conform to regulations published pursuant to Section 304 (h) of the Clean Water Act (the "Act"), as amended, under which such procedures may be required.

b. Unless otherwise noted in the permit, all pollutant parameters shall be determined according to methods prescribed in Title 40, CFR, Part 136, as amended, promulgated pursuant to Section 304 (h) of the Act. For each pollutant parameter, a method shall be used which is sensitive enough to allow demonstration of compliance with the permit limits for that parameter if such a method exists. In the case where the permittee reports results indicating that the minimum level of quantitation (ML) determined using the most sensitive method is greater than the permit limit, the test method used and the data demonstrating how the ML was determined must be reported to the Director unless the Required Detection Levels are being met. Unless in specific cases other detection limits are demonstrated to be the best achievable because of the particular nature of the wastewater being analyzed, the ML shall not be greater than the required detection levels listed in the rules of the Department of Environment and Conservation, Division of Water Pollution Control, Chapter 1200-4-3-.05 (8).

c. Total Residual Chlorine

The acceptable methods for analysis of TRC are any methods specified in Title 40, CFR Part 136. The method detection level (MDL) for TRC shall not exceed 0.05 mg/L unless the permittee demonstrates that its MDL is higher. The permittee shall retain the documentation that justifies the higher MDL, and shall have that documentation available for review upon request. In cases where the permit limit is less than the MDL, the reporting of TRC at less than the MDL shall be interpreted to constitute compliance with the permit limit.

d. Total Mercury and Methylmercury

The acceptable method for analysis of total mercury is EPA Method 245.7, with a quantitation level of 0.5 ppt or 0.5 ng/l. At the issuance of this permit, no analytical methods for methyl mercury have been approved under 40 CFR Part 136, however, EPA Method 1630 will be acceptable for monitoring under this permit until one or more methods are approved.

4. Recording of Results

For each measurement or sample taken pursuant to the requirements of this permit, the permittee shall record the following information:

a. The exact place, date and time of sampling;
b. The exact person(s) collecting samples;
c. The dates and times the analyses were performed;
d. The person(s) or laboratory who performed the analyses;
e. The analytical techniques or methods used, and;
f. The results of all required analyses.

5. Records Retention

All records and information resulting from the monitoring activities required by this permit including all records of analyses performed and calibration and maintenance of instrumentation shall be retained for a minimum of three (3) years, or longer, if requested by the Division of Water Pollution Control.

E. DEFINITIONS

The ***Daily Maximum Concentration*** is a limitation on the average concentration, in the appropriate unit such as milligrams per liter (mg/L), of the discharge during any calendar day. When a proportional-to-flow composite sampling device is used, the daily maximum concentration is the concentration of that 24-hour composite; when other sampling means are used, the daily maximum concentration is the arithmetic mean of the concentrations of equal volume samples collected during any calendar day or sampling period.

The ***Monthly Average Concentration***, a limitation on the discharge concentration, in the appropriate unit such as milligrams per liter (mg/L), is the arithmetic mean (or geometric mean for E. coli tests) of all daily concentrations determined in a one-month period. For the purpose of this definition, a frequency of 2/Month is representative of 2 separate samples, each sample having been collected on a separate day during the monitoring period.

The ***Monthly Average Amount***, a discharge limitation measured in pounds per day (lb/day), is the total amount of any pollutant in the discharge by weight during a calendar month divided by the number of days in the month that the production or commercial facility was operating. Where less than daily sampling is required by a permit, the monthly average amount shall be determined by the summation of all the measured discharges by weight divided by the number of days during the calendar month when the measurements were made. For the purpose of this definition, a frequency of 2/Month is representative of 2 separate samples, each sample having been collected on a separate day during the monitoring period.

The ***Daily Maximum Amount*** is a limitation measured in pounds per day (lb/day), on the total amount of any pollutant in the discharge by weight during any calendar day .

A ***Composite Sample***, for the purposes of this permit, is a sample collected continuously over a period of 24-hours at a rate proportional to the flow. Composite sample should be a combination of at least 8 sample aliquots of at least 100 milliliters, collected at periodic intervals during the operating hours of a facility over a 24-hour period. For analyses of radiological parameters, a monthly composite sample shall be obtained per procedures documented in the Water Quality Protection Plan.

For the purposes of this permit, a ***Composite Sample*** for non-storm water discharges may be either a sample collected continuously over a period of 24-hours at a rate proportional to the flow, or a composite sample of at least 24 grab samples collected at regular time intervals over a period of 24-hours. Stormwater composite samples will be defined in the Water Quality Protection Plan.

A ***Grab Sample***, for the purposes of this permit, is defined as a single effluent sample of at least 100 milliliters (sample volumes <100 milliliters are allowed when specified per standard methods, latest edition) collected at a randomly selected time over a period not exceeding 15 minutes. The sample(s) shall be collected at the period(s) representative of the total discharge.

For the purpose of this permit, a ***Calendar Day*** is defined as any 24-hour period.

For the purpose of this permit, Quarterly means once every three months. A ***Quarter*** is defined as any one of the following three month periods: January 1 through March 31, April 1 through June 30, July 1

through September 30, or October 1 through December 31. Quarterly monitoring requirements listed in this permit shall begin on the next quarterly period following the effective date of the renewed permit.

For the purpose of this permit, ***Semi-annually*** means the same as "once every six months." Measurements of the effluent characteristics concentrations may be made anytime during a 6 month period beginning from the effective date of this permit so long as the second set of measurements for a given 12 month period are made approximately 6 months subsequent to that time, if feasible.

For the purpose of this permit, ***Once every two months (1/2 months)*** means the reporting period will end on the even-numbered months, i.e. after February for the two-month period of January-February, after April for March-April, etc.

For the purpose of this permit, ***Annually*** is defined as a monitoring frequency of once every calendar year so long as the following set of annual measurements are made approximately 12 months subsequent.

F. REPORTING

1. Monitoring Results

Monitoring results shall be recorded and submitted monthly using Discharge Monitoring Report (DMR) forms supplied by the Division of Water Pollution Control. Submittals shall be postmarked no later than **last day of the month** after the completion of the reporting period. A copy shall be retained for the permittee's files. The original DMRs and other required submittals regarding compliance with the conditions of this permit must be sent to:

TENNESSEE DEPT. OF ENVIRONMENT & CONSERVATION
DIVISION OF WATER POLLUTION CONTROL
COMPLIANCE REVIEW SECTION
401 CHURCH STREET
L & C ANNEX 6TH FLOOR
NASHVILLE TN 37243-1534

A copy of each DMR or other required submittal shall be forwarded to the TDEC Knoxville Environmental Field Office and the TDEC Division of DOE Oversight. The first DMR is due on the **last day** of the month following permit effectiveness.

DMRs and any other information or report must be signed and certified by a responsible corporate officer as defined in 40 CFR 122.22, a general partner or proprietor, or a principal municipal executive officer or ranking elected official, or his duly authorized representative. Such authorization must be submitted in writing and must explain the duties and responsibilities of the authorized representative.

The electronic submission of DMRs will be accepted only if approved in writing by the division. For purposes of determining compliance with this permit, data submitted in electronic format is legally equivalent to data submitted on signed and certified DMR forms.

2. Additional Monitoring by Permittee

With the exception of E. coli monitored more frequently than once per 12 hours, if the permittee monitors any pollutant specifically limited by this permit more frequently than required at the location(s) designated, using approved analytical methods as specified herein, the results of such monitoring shall be included in the calculation and reporting of the values required in the DMR form. Such increased frequency shall also be indicated on the form.

3. Falsifying Results and/or Reports

Knowingly making any false statement on any report required by this permit or falsifying any result may result in the imposition of criminal penalties as provided for in Section 309 of the Federal Water Pollution Control Act, as amended, and in Section 69-3-115 of the Tennessee Water Quality Control Act.

4. Outlier Data

Outlier data include analytical results that are probably false. The validity of results is based on operational knowledge and a properly implemented quality assurance program. False results may include laboratory artifacts, potential sample tampering, broken or suspect sample containers, sample contamination or similar demonstrated quality control flaw.

Outlier data are identified through a properly implemented quality assurance program, and according to ASTM standards (e.g. Grubbs Test, 'h' and 'k' statistics). Furthermore, outliers should be verified, corrected, or removed, based on further inquiries into the matter. If an outlier was verified through repeated testing and/or analysis, it should remain in the preliminary data set. If an outlier resulted from a transcription or similar clerical error, it should be corrected and subsequently reported.

Therefore, only if an outlier was associated with problems in the collection or analysis of the samples and as such does not conform with the Guidelines Establishing Test Procedures for the Analysis of Pollutants (40 CFR §136), it can be removed from the data set and not reported on the Discharge Monitoring Report forms (DMRs). Otherwise, all results (except E. coli results <12hours apart, but including monitoring of pollutants more frequently than required at the location(s) designated, using approved analytical methods as specified in the permit) should be included in the calculation and reporting of the values required in the DMR form. The permittee may use "comment" section of the DMR form (or attach additional pages), in order to explain any potential outliers or dubious results.

G. SCHEDULE OF COMPLIANCE

Except for those provisions listed in this section, full compliance and operational levels shall be attained from the effective date of this permit.

PART II

A. GENERAL PROVISIONS

1. Duty to Reapply

Permittee is not authorized to discharge after the expiration date of this permit. In order to receive authorization to discharge beyond the expiration date, the permittee shall submit such information and forms as are required to the Director of Water Pollution Control (the "Director") no later than 180 days prior to the expiration date. Such applications must be properly signed and certified.

2. Right of Entry

The permittee shall allow the Director, the Regional Administrator of the U.S. Environmental Protection Agency, or their authorized representatives, upon the presentation of credentials:

a. To enter upon the permittee's premises where an effluent source is located or where records are required to be kept under the terms and conditions of this permit, and at reasonable times to copy these records;

b. To inspect at reasonable times any monitoring equipment or method or any collection, treatment, pollution management, or discharge facilities required under this permit; and

c. To sample at reasonable times any discharge of pollutants.

3. Availability of Reports

Except for data determined to be confidential under Section 308 of the Federal Water Pollution Control Act, as amended, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Division of Water Pollution Control. As required by the Federal Act, effluent data shall not be considered confidential.

4. Proper Operation and Maintenance

a. The permittee shall at all times properly operate and maintain all facilities and systems (and related appurtenances) for collection and treatment which are installed or used by the permittee to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance also includes adequate laboratory and process controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit. Backup continuous pH and flow monitoring equipment are not required.

b. Dilution water shall not be added to comply with effluent requirements to achieve BCT, BPT, BAT and or other technology-based effluent limitations such as those in State of Tennessee Rule 1200-4-5-.09.

5. Treatment Facility Failure

The permittee, in order to maintain compliance with this permit, shall control production, all discharges, or both, upon reduction, loss, or failure of the treatment facility, until the facility is restored or an alternative method of treatment is provided. This requirement applies in such situations as the reduction, loss, or failure of the primary source of power.

6. Property Rights

The issuance of this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State, or local laws or regulations.

7. Severability

The provisions of this permit are severable. If any provision of this permit due to any circumstance, is held invalid, then the application of such provision to other circumstances and to the remainder of this permit shall not be affected thereby.

8. Other Information

If the permittee becomes aware that he failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, then he shall promptly submit such facts or information.

B. CHANGES AFFECTING THE PERMIT

1. Planned Changes

The permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

a. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR 122.29(b); or

b. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under 40 CFR 122.42(a)(1).

2. Permit Modification, Revocation, or Termination

a. This permit may be modified, revoked and reissued, or terminated for cause as described in 40 CFR 122.62 and 122.64, Federal Register, Volume 49, No. 188 (Wednesday, September 26, 1984), as amended.

b. The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

c. If any applicable effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established for any toxic pollutant under Section 307(a) of the Federal Water Pollution Control Act, as amended, the Director shall modify or revoke and reissue the permit to conform to the prohibition or to the effluent standard, providing that the effluent standard is more stringent than the limitation in the permit on the toxic pollutant. The permittee shall comply with these effluent standards or prohibitions within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified or revoked and reissued to incorporate the requirement.

d. The filing of a request by the permittee for a modification, revocation, reissuance, termination, or notification of planned changes or anticipated noncompliance does not halt any permit condition.

3. Change of Ownership

This permit may be transferred to another party (provided there are neither modifications to the facility or its operations, nor any other changes which might affect the permit limits and conditions contained in the permit) by the permittee if:

a. The permittee notifies the Director of the proposed transfer at least 30 days in advance of the proposed transfer date;

b. The notice includes a written agreement between the existing and new permittees containing a specified date for transfer of permit responsibility, coverage, and liability between them; and

c. The Director, within 30 days, does not notify the current permittee and the new permittee of his intent to modify, revoke or reissue, or terminate the permit and to require that a new application be filed rather than agreeing to the transfer of the permit.

Pursuant to the requirements of 40 CFR 122.61, concerning transfer of ownership, the permittee must provide the following information to the division in their formal notice of intent to transfer ownership: 1) the NPDES permit number of the subject permit; 2) the effective date of the proposed transfer; 3) the name and address of the transferor; 4) the name and address of the transferee; 5) the names of the responsible parties for both the transferor and transferee; 6) a statement that the transferee assumes responsibility for the subject NPDES permit; 7) a statement that the transferor relinquishes responsibility for the subject NPDES permit; 8) the signatures of the responsible parties for both the transferor and transferee pursuant to the requirements of 40 CFR 122.22(a), “Signatories to permit applications”; and, 9) a statement regarding any proposed modifications to the facility, its operations, or any other changes which might affect the permit limits and conditions contained in the permit.

4. Change of Mailing Address

The permittee shall promptly provide to the Director written notice of any change of mailing address. In the absence of such notice the original address of the permittee will be assumed to be correct.

C. NONCOMPLIANCE

1. Effect of Noncompliance

All discharges shall be consistent with the terms and conditions of this permit. Any permit noncompliance constitutes a violation of applicable State and Federal laws and is grounds for enforcement action, permit termination, permit modification, or denial of permit reissuance.

2. Reporting of Noncompliance

a. 24-Hour Reporting

In the case of any noncompliance which could cause a threat to public drinking supplies, or any other discharge which could constitute a threat to human health or the environment, the required notice of non-compliance shall be provided to the Division of Water Pollution Control in the appropriate Environmental Assistance Center within 24-hours from the time the permittee becomes aware of the circumstances. (The Environmental Assistance Center should be contacted for names and phone numbers of environmental response personnel).

A written submission must be provided within ten days of the time the permittee becomes aware of the circumstances unless this requirement is waived by the Director on a case-by-case basis. The permittee shall provide the Director with the following information:

i. A description of the discharge and cause of noncompliance;

ii. The period of noncompliance, including exact dates and times or, if not corrected, the anticipated time the noncompliance is expected to continue; and

iii. The steps being taken to reduce, eliminate, and prevent recurrence of the noncomplying discharge.

b. Scheduled Reporting

For instances of noncompliance which are not reported under subparagraph 2.a. above, the permittee shall report the noncompliance on the Discharge Monitoring Report. The report shall contain all information concerning the steps taken, or planned, to reduce, eliminate, and prevent recurrence of the violation and the anticipated time the violation is expected to continue.

3. Sanitary Sewer Overflow

a. "***Sanitary Sewer Overflow***" means the discharge to land or water of wastes from any portion of the collection, transmission, or treatment system other than through permitted outfalls.

b. Sanitary Sewer Overflows are prohibited.

c. The permittee shall operate the collection system so as to avoid sanitary sewer overflows. No new or additional flows shall be added upstream of any point in the collection system, which experiences chronic sanitary sewer overflows (greater than 5 events per year) or would otherwise overload any portion of the system.

d. Unless there is specific enforcement action to the contrary, the permittee is relieved of this requirement after: 1) an authorized representative of the Commissioner of the Department of Environment and Conservation has approved an engineering report and construction plans and specifications prepared in accordance with accepted engineering practices for correction of the problem; 2) the correction work is underway; and 3) the cumulative, peak-design, flows potentially added from new connections and line extensions upstream of any chronic overflow point are less than or proportional to the amount of inflow and infiltration removal documented upstream of that point. The inflow and infiltration reduction must be measured by the permittee using practices that are customary in the environmental engineering field and reported in an attachment to a Monthly Operating Report submitted to the local TDEC Environmental Assistance Center. The data measurement period shall be sufficient to account for seasonal rainfall patterns and seasonal groundwater table elevations.

e. In the event that more than five (5) sanitary sewer overflows have occurred from a single point in the collection system for reasons that may not warrant the self-imposed moratorium or completion of the actions identified in this paragraph, the permittee may request a meeting with the Division of Water Pollution Control EAC staff to petition for a waiver based on mitigating evidence.

4. Upset

a. "***Upset***" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

b. An upset shall constitute an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the permittee demonstrates, through properly signed, contemporaneous operating logs, or other relevant evidence that:

i. An upset occurred and that the permittee can identify the cause(s) of the upset;

ii. The permitted facility was at the time being operated in a prudent and workman-like manner and in compliance with proper operation and maintenance procedures;

iii. The permittee submitted information required under "Reporting of Noncompliance" within 24-hours of becoming aware of the upset (if this information is provided orally, a written submission must be provided within ten days); and

iv. The permittee complied with any remedial measures required under "Adverse Impact."

5. Adverse Impact

The permittee shall take all reasonable steps to minimize any adverse impact to the waters of Tennessee resulting from noncompliance with this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncompliant discharge. It shall not be a defense for the permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

6. Bypass

a. "***Bypass***" is the intentional diversion of wastewater away from any portion of a treatment facility. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Bypasses are prohibited unless the following 3 conditions are met:

i. The bypass is unavoidable to prevent loss of life, personal injury, or severe property damage;

ii. There are not feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a

bypass which occurred during normal periods of equipment down-time or preventative maintenance;

iii. The permittee submits notice of an unanticipated bypass to the Division of Water Pollution Control in the appropriate environmental assistance center within 24-hours of becoming aware of the bypass (if this information is provided orally, a written submission must be provided within ten days). When the need for the bypass is foreseeable, prior notification shall be submitted to the Director, if possible, at least 10 days before the date of the bypass.

c. Bypasses not exceeding limitations are allowed **only** if the bypass is necessary for essential maintenance to assure efficient operation. All other bypasses are prohibited. Allowable bypasses not exceeding limitations are not subject to the reporting requirements of 6.b.iii, above.

d. Bypass does not include diverting from one treatment unit of treatment facility to another for alternate treatment.

7. Washout

a. For sanitary wastewater plants only, a "washout" shall be defined as loss of Mixed Liquor Suspended Solids (MLSS) of 30.00% or more. This refers to the MLSS in the aeration basin(s) only. This does not include MLSS decrease due to solids wasting to the sludge disposal system. A washout can be caused by improper operation or from peak flows due to infiltration and inflow.

b. A washout is prohibited. If a washout occurs the permittee must report the incident to the Division of Water Pollution Control in the appropriate Environmental Field Office within 24-hours by telephone. A written submission must be provided within 10 days. The washout must be noted on the discharge monitoring report. Each day of a washout is a separate violation.

D. LIABILITIES

1. Civil and Criminal Liability

Except as provided in permit conditions for "**Bypassing,**" “Sanitary Sewer **Overflow,**” and "**Upset,**" nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance. Notwithstanding this permit, the permittee shall remain liable for any damages sustained by the State of Tennessee, including but not limited to fish kills and losses of aquatic life and/or wildlife, as a result of the discharge of wastewater to any surface or subsurface waters. Additionally, notwithstanding this Permit, it shall be the responsibility of the permittee to conduct its wastewater treatment and/or discharge activities in a manner such that public or private nuisances or health hazards will not be created.

2. Liability Under State Law

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or the Federal Water Pollution Control Act, as amended.

PART III

OTHER REQUIREMENTS

A. TOXIC POLLUTANTS

The permittee shall notify the Division of Water Pollution Control as soon as it knows or has reason to believe:

1. That any activity has occurred or will occur which would result in the discharge on a routine or frequent basis, of any toxic substance(s) (listed at 40 CFR 122, Appendix D, Table II and III) which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

a. One hundred micrograms per liter (100 ug/l);

b. Two hundred micrograms per liter (200 ug/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 ug/l) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony;

c. Five (5) times the maximum concentration value reported for that pollutant(s) in the permit application in accordance with 122.21(g)(7); or

d. The level established by the Director in accordance with 122.44(f).

2. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

a. Five hundred micrograms per liter (500 ug/l);

b. One milligram per liter (1 mg/L) for antimony;

c. Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 122.21(g)(7); or

d. The level established by the Director in accordance with 122.44(f).

B. REOPENER CLAUSE

If an applicable standard or limitation is promulgated under Sections 301(b)(2)(C) and (D), 304(B)(2), and 307(a)(2) and that effluent standard or limitation is more stringent than any effluent limitation in the permit or controls a pollutant not limited in the permit, the permit shall be promptly modified or revoked and reissued to conform to that effluent standard or limitation.

C. PLACEMENT OF SIGNS

Within sixty (60) days of the effective date of this permit, the permittee shall place and maintain a sign(s) at a conspicuous location near the Sewage Treatment Plant and place and maintain signs at outfalls and any bypass/overflow point in the collection sanitary sewer collection system.. For the purposes of this requirement, any bypass/overflow point that has discharged five (5) or more times in the last year must be so posted. The sign(s) should be clearly visible to the public from the bank and the receiving stream or from the nearest public property/right-of-way, if applicable.

For the sign near the Sewage Treatment Plant, the minimum sign size should be two feet by two feet (2' x 2') with one inch (1") letters. The sign should be made of durable material and have a white background with black letters. The sign should provide notice to the public as to the nature of the discharge and, in the case of the permitted outfalls, that the discharge is regulated by the Tennessee Department of Environment and Conservation, Division of Water Pollution Control. The following is given as an example of the minimal amount of information that must be included on the sign:

TREATED INDUSTRIAL WASTEWATER [or INDUSTRIAL STORMWATER]
USDOE-Oak Ridge National Laboratory
(Permittee's Phone Number)
NPDES Permit NO. TN0002941
TENNESSEE DIVISION OF WATER POLLUTION CONTROL
1-888-891-8332 ENVIRONMENTAL FIELD OFFICE- KNOXVILLE

Individual outfall signs need list only the Outfall number. These signs should be made of durable material and have a white background with black letters

D. ANTIDEGRADATION

Pursuant to the Rules of the Tennessee Department of Environment and Conservation, Chapter 1200-4-3-.06, titled “Tennessee Antidegradation Statement,” and in consideration of the Department’s directive in attaining the greatest degree of effluent reduction achievable in municipal, industrial, and other wastes, the permittee shall further be required, pursuant to the terms and conditions of this permit, to comply with the effluent limitations and schedules of compliance required to implement applicable water quality standards, to comply with a State Water Quality Plan or other State or Federal laws or regulations, or where practicable, to comply with a standard permitting no discharge of pollutants.

E. BIOMONITORING REQUIREMENTS, CHRONIC

The permittee shall conduct a 3-Brood *Ceriodaphnia dubia* Survival and Reproduction Test and a 7-Day Fathead Minnow *(Pimephales promelas)* Larval Survival and Growth Test on the same samples of final effluent from Outfalls X01 and X12.

The measured endpoint for toxicity will be the inhibition concentration causing 25% reduction (IC25) in survival, reproduction, or growth of the test organisms. The IC25 shall be determined based on a 25% reduction as compared to the controls. The average reproduction and growth responses will be determined based on the number of *Ceriodaphnia dubia* or *Pimephales promelas* larvae used to initiate the test.

Tests shall be conducted and its results reported based on appropriate replicates of a total of five serial dilutions and a control, using the percent effluent dilutions as presented in the following table:

OUTFALL X01

Serial Dilutions for Whole Effluent Toxicity (WET) IC25 Testing					
100% Effluent	**(100+PL)/2**	**Permit Limit (PL)**	**0.50 X PL**	**0.25 X PL**	**Control**
% effluent					
100	**57.75**	**15.5**	**7.8**	**3.9**	**0**

OUTFALL X12

Serial Dilutions for Whole Effluent Toxicity (WET) IC25 Testing					
100% Effluent	**(100+PL)/2**	**Permit Limit (PL)**	**0.50 X PL**	**0.25 X PL**	**Control**
% effluent					
100	**65.2**	**30.5**	**15.2**	**7.6**	**0**

The dilution/control water used will be moderately hard water as described in Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, EPA-821-R-02-013 (or the most current edition). Results from a chronic standard reference toxicant quality assurance test for each species tested shall be submitted with the discharge monitoring report. Reference toxicant tests shall be conducted as required in EPA-821-R-02-013 (or the most current edition). Additionally, the analysis of this multi-concentration test shall include review of the concentration-response relationship to ensure that calculated test results are interpreted appropriately.

Toxicity will be demonstrated if the IC25 is less than or equal to the permit limit indicated for each outfall in the above table(s). Toxicity demonstrated by the tests specified herein constitutes a violation of this permit.

All tests will be conducted using a minimum of three composite samples of final effluent (e.g., collected on days 1, 3 and 5). If, in any control more than 20% of the test organisms die in 7 days, the test (control and effluent) is considered invalid and the test shall be repeated within 30 days of the date the initial test is invalidated. Furthermore, if the results do not meet the acceptability criteria of section 4.9.1, EPA-821-R-02-013 (or the most current edition), or if the required concentration-response review fails to yield a valid relationship per guidance

contained in Method Guidance and Recommendations for Whole Effluent Toxicity (WET) Testing, EPA-821-B-00-004 (or the most current edition), that test shall be repeated. Any test initiated but terminated before completion must also be reported along with a complete explanation for the termination.

The toxicity tests specified herein shall be conducted semi-annually (2/Year) and begin no later than 90 days from the effective date of this permit.

In the event of a test failure, the permittee must start a follow-up test within 2 weeks and submit results from a follow-up test within 30 days from obtaining initial WET testing results. The follow-up test must be conducted using the same serial dilutions as presented in the corresponding table(s) above. **The follow-up test will not negate an initial failed test. In addition, the failure of a follow-up test will constitute a separate permit violation which must also be reported.**

In the event of 3 consecutive test failures for the same outfall, the permittee must initiate a Toxicity Identification Evaluation/Toxicity Reduction Evaluation (TIE/TRE) study within 30 days and so notify the division by letter. This notification shall include a schedule of activities for the initial investigation of that outfall. Additionally, the permittee shall submit progress reports once every three months throughout the term of the TIE/TRE study. The toxicity must be reduced to allowable limits for that outfall within 2 years of initiation of the TIE/TRE study. Subsequent to the results obtained from the TIE/TRE studies, the permittee may request an extension of the TIE/TRE study period if necessary to conduct further analyses. The final determination of any extension period will be made at the discretion of the division.

The TIE/TRE study may be terminated at any time upon the completion and submission of 2 consecutive tests (for the same outfall) demonstrating compliance.

Test procedures, quality assurance practices, determinations of effluent survival/reproduction and survival/growth values, and report formats will be made in accordance with Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, EPA-821-R-02-013, or the most current edition.

Results of all tests, reference toxicant information, copies of raw data sheets, statistical analysis and chemical analyses shall be compiled in a report. The report will be written in accordance with Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, EPA-821-R-02-013, or the most current edition.

F. BIOMONITORING REQUIREMENTS, ACUTE

The permittee shall conduct a 48-hour static acute toxicity test on two test species on the same samples of final effluent from Outfalls X01and X12. The test species to be used are Water Fleas (*Ceriodaphnia dubia)* and Fathead Minnows *(Pimephales promelas*).

The measured endpoint for toxicity will be the concentration causing 50% lethality (LC50) of the test organisms. The LC50 shall be determined based on 50% lethality as compared to the controls.

Test shall be conducted and its results reported based on appropriate replicates of a total of five serial dilutions and a control, using the percent effluent dilutions as presented in the following table:

OUTFALL XO1

Serial Dilutions for Whole Effluent Toxicity (WET) Testing					
100% Effluent	**(100+PL)/2**	**Permit Limit (PL)**	**0.50 X PL**	**0.25 X PL**	**Control**
% effluent					
100	**84.7**	**69.4**	**34.7**	**17.35**	**0**

OUTFALL X12

Serial Dilutions for Whole Effluent Toxicity (WET) Testing					
Permit Limit (PL)	**0.50 X PL**	**0.25 X PL**	**0.125 X PL**	**0.0625 X PL**	**Control**
% effluent					
100	**50**	**25**	**12.5**	**6.25**	**0**

The dilution/control water used will be moderately hard water as described in Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, EPA-821-R-02-012 (or the most current edition). Results from an acute standard reference toxicant quality assurance test for each species tested shall be submitted with the discharge monitoring report. Reference toxicant tests shall be conducted as required in EPA-821-R-02-012 (or the most current edition). Additionally, the analysis of this multi-concentration test shall include review of the concentration-response relationship to ensure that calculated test results are interpreted appropriately.

Toxicity will be demonstrated if the LC50 is less than or equal to the permit limit indicated for each outfall in the above tables. Toxicity demonstrated by the tests specified herein constitutes a violation of this permit.

All tests will be conducted using four separate grab samples of final effluent, to be used in four separate tests, and shall be collected at evenly spaced (6-hour) intervals over a 24-hour period. If, in any control more than 10% of the test organisms die in 48 hours, the test (control and effluent) is considered invalid and the test shall be repeated within 30 days of the date the initial test is invalidated. Furthermore, if the results do not meet the acceptability criteria as defined in Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, EPA-821-R-02-012, or if the required concentration-response review fails to yield a valid relationship per guidance contained in Method Guidance and Recommendations for Whole Effluent Toxicity (WET) Testing, EPA-821-B-00-004 (or the most current edition), that test shall be repeated. Any test initiated but terminated before completion must also be reported along with a complete explanation for the termination.

The toxicity tests specified herein shall be conducted semi-annually (2/yearly) for Outfalls X01 and X12 and begin no later than 90 days from the effective date of this permit.

In the event of a test failure, the permittee must start a follow-up test within 2 weeks and submit results from a follow-up test within 30 days from obtaining initial WET testing results. The follow-up test must be conducted using the same serial dilutions as presented in the corresponding table(s) above. The follow-up test will not negate an initial failed test. In

addition, the failure of a follow-up test will constitute a separate permit violation which must also be reported.

In the event of 3 consecutive test failures within a 12 month period for the same outfall, the permittee must initiate a Toxicity Identification Evaluation/Toxicity Reduction Evaluation (TIE/TRE) study within 30 days and so notify the division by letter. This notification shall include a schedule of activities for the initial investigation of that outfall. During the term of the TIE/TRE study, the frequency of biomonitoring shall be once every three months. Additionally, the permittee shall submit progress reports once every three months throughout the term of the TIE/TRE study. The toxicity must be reduced to allowable limits for that outfall within 2 years of initiation of the TIE/TRE study. Subsequent to the results obtained from the TIE/TRE studies, the permittee may request an extension of the TIE/TRE study period if necessary to conduct further analyses. The final determination of any extension period will be made at the discretion of the division.

The TIE/TRE study may be terminated at any time upon the completion and submission of 2 consecutive tests (for the same outfall) demonstrating compliance. Following the completion of TIE/TRE study, the frequency of monitoring will return to a regular schedule, as defined previously in this section as well in Part I of the permit. During the course of the TIE/TRE study, the permittee will continue to conduct toxicity testing of the outfall being investigated at the frequency of once every three months but will not be required to perform follow-up tests for that outfall during the period of TIE/TRE study.

Test procedures, quality assurance practices and determination of effluent lethality values will be made in accordance with Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, EPA-821-R-02-012, or the most current edition.

Results of all tests, reference toxicant information, copies of raw data sheets, statistical analysis and chemical analysis shall be compiled in a report. The report shall be written in accordance with Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, EPA-821-R-02-012, or the most current edition.

Copies of biomonitoring reports (including follow-up reports) shall be submitted to the division per the Reporting requirements in Part I. G. of this permit..

G. WASTEWATER CONTROL

The permittee shall develop wastewater control criteria and procedures for their implementation.

The permittee shall provide the Division a description of the procedures and criteria used to determine which wastewaters are routed to which treatment system.

The report describing these procedures shall include safeguards that are in place to prevent introduction of wastewaters into a treatment system which are not appropriate for treatment. The report should also describe how a wastewater would be evaluated if it is of unusual character or different than what has been historically handled by the treatment systems. This description shall include a description of record-keeping and documentation of this process.

The report shall be submitted to the Division within one year of the permit effective date. Documentation of such decisions and operational records for the wastewater systems shall be

maintained for at least three years and shall be made available to Department personnel within 15 days if requested.

PART IV

A. WATER QUALITY PROTECTION PLAN (WQPP)

Organizing all category outfall monitoring, best management practices and biological monitoring into a single WQPP is intended to establish better linkages between water quality monitoring and detecting and abating water quality and ecological impact. Annually, the permittee will prepare for the Division a report and/or presentation that documents results from the previous year's monitoring. The first WQPP will be prepared and submitted for review and approval by the Division within 90 days of the effective date of the permit.

The WQPP will:

- Establish dry-weather and wet-weather monitoring requirements for category outfalls that are appropriate and specific to the types of wastewaters discharged and pollutants expected to be present.
- Include best management practices for stormwater and non-stormwater discharges.
- Include biological community monitoring and the monitoring of bioaccumulation of Hg and PCBs in fish tissue.
- Include instream monitoring for Hg and MeHg in water.
- Include monitoring of outfalls for radioactivity.

The WQPP incorporates the goals of several plans established under previous permits, including the Storm Water Pollution Prevention Plan, Best Management Practices Plan [non-storm water], the Chlorine Control Strategy, Radiological Monitoring Plan, and the Biological Monitoring and Abatement Plan (BMAP).

The WQPP is to be reviewed annually, revised as appropriate, and submitted to the Division for review and comment. Revisions of the WQPP will not require a modification of this permit.

B. GUIDELINES FOR THE DEVELOPMENT OF THE WATER QUALITY PROTECTION PLAN:

1. STORM WATER POLLUTION PREVENTION

The Water Quality Protection Plan (WQPP) will include site specific best management practices and monitoring to ensure that runoff from the facility site is not a significant source of pollution to the receiving stream. The WQPP will address storm water pollution prevention consistent with guidance set forth in:

- 1. TN Storm Water Multi-Sector General Permit for Industrial Activities, Part 4. A. 1, "Storm Water Pollution Prevention Plan Requirements" for Existing Facilities, or the latest applicable version;
- 2. EPA guidance manual titled "Storm Water Management for Industrial Activities, Developing Pollution Prevention Plans and Best Management Practices", (EPA 832-R-92-006), September, 1992, and
- EPA guidance manual titled "Summary Guidance", (EPA 833-R-92-002), October, 1992; and

- Tennessee Erosion and Sediment Control Handbook
- Tennessee General NPDES Permit for Stormwater Discharges Associated with Construction Activities
- other guidance as appropriate.

The WQPP annual report shall use results of the storm water monitoring to evaluate the effectiveness of best management practices. The annual report is to address verification of plan effectiveness, define pollutant loadings, and adjust future storm water monitoring efforts if necessary. The annual report will include a summary of the previous year's construction projects and an evaluation of the effectiveness of construction stormwater controls. To address potential future changes, the report will also address planned projects and will identify, to the extent practicable, potential improvements to the processes used to control construction site runoff**.**

Note: This section addresses runoff from operating areas under DOE control. We recognize that future site development will result in cooperative activities being undertaken on the DOE Reservation by local, state, and other federal agencies. Effective control of stormwater requires that each activity be subject to proper planning, permitting, and oversight for development and operations. As the host of these activities offering and the organization offering infrastructure support, the Oak Ridge National Laboratory remains ultimately responsible for water quality effects of tenant activities which discharge to the ORNL storm sewer system.

At a minimum, the WQPP shall address:

a. Pollutant Sources And Pathways

1. A site map outlining the individual storm water drainage areas, existing structural control measures, surface water bodies, and sinkholes

2. A narrative description of significant materials (40 CFR 122.26) that are currently or in the past have been treated, stored, or disposed outside; materials management practices; existing structural and non-structural control measures to reduce pollutants; and a description of any storm water treatment

3. A list of significant spills and leaks of toxic or hazardous pollutants at the facility that have taken place after the effective date of the permit

4. A prediction of direction of flow and the possible pollutants associated with each area of ORNL that generates storm water

5. A record of available sampling data describing pollutants in storm water discharges.

b. Storm Water Management Controls

1. Formulate a storm water pollution prevention team with named individuals who will develop the storm water pollution prevention elements of the WQPP and assist ORNL manager in their implementation.

2. Due to the significant stormwater impacts from CERCLA remediation projects, a representative from the remediation staff should be included on the storm water pollution prevention team.

3. Inventory types of materials handled and associated potential of release to storm water. Evaluate the following for potential pollutant contribution: loading and unloading operations, outdoor storage and manufacturing activities, dust or particulate generating processes, and on-site waste disposal practices. Consider toxicity of chemicals, quantity of chemicals, and history of leaks or spills of toxic or hazardous pollutants.

4. Design a preventive maintenance program including inspection and maintenance of storm water management devices and testing ORNL equipment and systems to uncover conditions which could cause failures.

5. Maintain a clean, orderly facility.

6. Establish spill prevention and response procedures. Identify potential spill areas and drainage points. Specify material handling procedures and storage requirements. Identify spill cleanup procedures and provide to responsible personnel. Make available to responsible personnel the necessary equipment to implement cleanup at all times when the facility is in operation.

7. Include in the plan a narrative of traditional storm water management practices, i.e., other than those which control the source of pollutants.

8. Identify areas of potentially high soil erosion and measures to limit erosion.

9. Train employees at all levels of responsibility in the components of the storm water pollution prevention measures of the WQPP.

10. Identify qualified personnel to inspect equipment, ORNL areas, and material handling areas. Maintain records of inspections and ensure corrective actions are implemented..

11. Designate a position in the plan, such as the Spill Response Coordinator, who will keep records of spills or other discharges, inspections and maintenance activities, and information describing the quality and quantity of storm water discharges.

12. Identify any non-storm water discharges, and their source(s), associated with the storm water outfalls. In the event non-storm water discharges are discovered in combination with the storm water discharges, the permittee must submit the appropriate EPA form(s) for the characterization of these non-storm water discharges as warranted.

13. Develop wastewater controls for stormwater per Part III Section I.

c. Facility Inspection

Personnel in responsible position(s), as named in the plan, will inspect the facility at least semi-annually for the accuracy of the plan and maps, adequate measures to reduce pollutants in storm water runoff, and the need for additional controls. Records of these inspections will be maintained for a period of three years.

d. Spill Prevention Control And Countermeasures

Storm water management programs may reflect requirements for spill prevention control and countermeasures (SPCC) plans under Section 311 of the CWA.

e. Monitoring Plan

Storm water discharges will be monitored per the approved WQPP. For each outfall monitored, the drainage area shll be characterized, including the total surface area and type of cover, for example, roof, pavement, grassy areas, and gravel areas will be identified.

f. SARA Title III, Section 313 Priority Chemicals

The stormwater pollution prevention portions of the WQPP shall include the following for those facilities subject to reporting requirements under SARA Title III, Section 313 for chemicals which are classified as Section 313 water priority chemicals:

1. In areas where Section 313 priority chemicals are stored, processed or otherwise handled, appropriate containment, drainage control and/or diversionary structures will be provided. At a minimum, one of the following preventive systems or its equivalent will be used:
   a. Curbing, culverting, gutters, sewers or other forms of drainage control
   b. Roofs, covers or other forms or protection to prevent storage piles from exposure to storm water and wind
2. The plan will include a discussion of measures taken to conform with the following applicable guidelines:
   a. In liquid storage areas where storm water comes into contact with any equipment, tank container, or other vessel used for Section 313 water priority chemicals,
      a. the tank or container must be compatible with Section 313 water priority chemical which it stores and
      b. the liquid storage areas shall be operated to minimize discharge of Section 313 chemicals.
   b. Material storage areas for Section 313 water priority chemicals, other than liquids, will incorporate features which will minimize the discharge of Section 313 chemicals by reducing storm water contact.
   c. Truck and rail car loading and unloading areas for Section 313 liquid chemicals will be operated to minimize discharges of chemicals. Appropriate measures may include placement and maintenance of drip pans for use when making and breaking hose connections; a spill contingency plan; and/or other equivalent measures.

d. In ORNL areas where Section 313 chemicals are transferred, processed or handled, piping, processing equipment, and materials handling equipment will be operated so as to minimize discharges of chemicals. Piping and equipment must be compatible with chemicals handled. Additional protection, including covers and guards to prevent exposure to wind, pressure relief vents, and overhangs or door skirts to enclose trailer ends at truck loading docks, will be implemented. Visual inspections or leak tests will be conducted on overhead piping that conveys Section 313 chemicals.

e. For discharges from areas covered by parts 2a, 2b, 2c, or 2d,

    a. the drainage should be restrained by manually-operated valves or other positive means to prevent the discharge of a spill or excessive leakage,
    b. flapper-type drain valves cannot be used for drainage of containment units,
    c. the final discharge of in-facility storm sewers should be equipped with a diversion system that could, in the event of an uncontrolled spill of a Section 313 chemical, return the spilled material to the facility, and
    d. the records of the frequency and estimated volume (in gallons) of discharges from containment areas will be maintained.

f. Facility site runoff other than from areas covered by parts 2a, 2b, 2c, and 2d from which runoff could contain Section 313 chemicals will incorporate the necessary drainage or other control features to prevent discharge of spilled or improperly disposed material and to ensure the reduction of pollutants in runoff or leachate.

g. All areas of the facility will be inspected at specific intervals for leaks or conditions that could lead to discharges of Section 313 water priority chemicals or direct contact of storm water with raw materials, intermediate materials, waste materials or products. Inspection intervals shall be specified in the plan and shall be based on design and operations experience. Corrective action will be taken promptly when a leak or condition, which could cause significant releases of a chemical is discovered. If corrective action can’t be taken immediately, the unit or process will be shut down until the situation is corrected. When a leak or spill has occurred, the contaminated material(s) must be promptly removed and disposed in accordance with Federal, State, and local requirements and as described in the plan.

h. Facilities will have the necessary security systems to prevent accidental or intentionally entry, which could cause a discharge.

i. Facility employees and contract personnel that work in areas where SARA title III, Section 313 water priority chemicals are used or stored will be trained in and informed of preventive measures at the facility. Employee training shall be conducted at least once per year in the pollution control laws and regulations and in the storm water protection components of the WQPP. The plan shall designate a person who is accountable for spill prevention at the facility and who will set up the necessary spill emergency procedures and reporting requirements.

3. "Section 313 water priority chemicals" means the following chemicals or chemical categories:

   a. listed at 40 CFR 372.65 pursuant to Section 313 of Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986, also titled the Emergency Planning and Community Right-to-Know Act of 1986;

   b. present at or above threshold levels at a facility subject to SARA Title III, Section 313 reporting requirements; and

   c. meeting at least one of the following criteria:
      i. listed in Appendix D of 40 CFR 122 on either Table II (organic priority pollutants), Table III (certain metals, cyanides, and phenols) or Table V (certain toxic pollutants and hazardous substances);
      ii. listed as a hazardous substance pursuant to section 311(b)(2)(A) of the CWA at 40 CFR 116.4; or
      iii. designated as pollutants for which EPA has published acute or chronic toxicity criteria

C. CONTROL OF RESIDUAL CHLORINE& BROMINE

The permittee shall incorporate in the WQPP a strategy to address total residual chlorine/bromine effects in the receiving waters from pertinent outfalls. Outfalls will be monitored at a frequency specified in the WQPP. Each outfall that is a chlorine/bromine source will be assessed to determine whether there is a significant chlorine/bromine load for dry weather conditions. “Significant” will be defined as those outfalls which contribute more than 1.2 grams of chlorine/bromine per day. If the loading exceeds 1.2 grams per day, the facility will have to take measures to investigate and remove sources of chlorine/bromine or provide treatment for the outfall such that chlorine/bromine from the outfall is reduced to less than 1.2 grams per day.

D. BIOLOGICAL MONITORING AND ABATEMENT

The WQPP shall include studies to annually evaluate the receiving streams' biological integrity in comparison to TN Water Quality Criteria. Prior to final WQPP approval, the USEPA will be given the opportunity to review and provide comments on the proposed biological monitoring.

1. Biosurveys

The biosurveys will consist of a single habitat semi-quantitative macroinvertebrate sample, fish community studies, and a habitat survey.

a. Macroinvertebrate Sample Collection

Habitat assessments, sample collection, subsampling, taxonomy and metric calculation must adhere exactly to the methodologies listed below. A semi-quantitative single habitat macroinvertebrate sample will be collected at each site. The habitat to be sampled will be appropriate for ecoregion 67f. Two (2) one meter square riffle kicks using a 500 micron mesh net will be collected. Debris from both kicks will be composited and preserved. All sorting and identification is to be conducted in the laboratory.

b. Macroinvertebrate Stream Survey Process:

Macroinvertebrate stream surveys will be conducted in accordance with the latest revision of TDEC Quality System Standard Operating Procedure for Macroinvertebrate Surveys.

Frequency – annually during low flow, high temperature conditions. (Exceptions are for specific streams which are dry in low flow).

The WQPP will identify the professional qualifications of personnel selected to perform the survey and will provide measures for advance notice of field work. The Divisions of WPC and DOE Oversight desire to be notified at least two weeks prior to conducting the biological survey.

Locations - The sites selected must provide appropriate habitat and must be generally comparable. All selected stream sampling points shall be identified in the WQPP and submitted for approval to the EFO.

c. Subsampling

All samples will be reduced to 200+/- 20% organisms following subsampling protocols detailed in section 7.3 *Laboratory Processing for Macroinvertebrate Samples* in EPA's Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers (EPA 841-B-99-002).

d. Taxonomy

All taxa in the subsample will be identified to genus level.

e. Biometrics

Biometrics from the most recent revision of TDEC Quality System Standard Operating Procedure for Macroinvertebrate Surveys will be calculated for each subsample (without extrapolation). At the time of permit issuance, the following biometrics were used:

Taxa Taxa Richness (TR)
Chironomidae and Oligochaeta Abundance (%OC)
North Carolina Biotic Index (NCBI)
Percent Nutrient Tolerant Organisms (%NUTOL)
Percent Clingers (%CLINGERS)
EPT Richness (EPT)
EPT Abundance (%EPT)

The following information will be recorded at each station during the biosurvey:

Water temperature (^{O}C)
Dissolved Oxygen (mg/l)
pH (S.U.)
Conductivity (umhos)
Stream Flow (cfs)

f. Habitat Assessment

Appropriate habitat assessment forms will be completed concurrent with each biological survey. These forms can be found in Appendix A-1 of EPA's Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers (EPA 841-B-99-002). The High Gradient Form will be used in conjunction with riffle kick collections.

2. Fish community studies

Fish community studies will continue. Index of Biotic Integrity (IBI) data will be reported to facilitate regional comparison.

a. Assessment for bioaccumulation in fish tissue

The permit requires assessment of mercury and PCBs in biota. Bioaccumulation of PCBs and mercury will continue being measured annually. Bioaccumulation data collected to support DOE's Environmental Management Programs may be used to meet this data requirement.

b. Mercury

Total mercury will be measured in fish fillets. In fish fillets, the total mercury may be conservatively assumed to represent methyl mercury content. Monitoring sites will be identified in the approved WQPP.

c. PCBs

Total PCBs will be measured in fish tissue samples. Monitoring sites will be identified in the approved WQPP.

3. Assessment of the impact of mercury abatement on water quality

a. Instream sampling for mercury

The WQPP shall include instream sampling for mercury. Both mercury and methyl mercury will be measured in all samples. Locations for sampling mercury instream shall be chosen so that the data will complement the data obtained from the mercury bioaccumulation sampling.

b. Sampling Outfalls for mercury

For outfalls which have a reasonable potential to discharge mercury, both mercury and methyl mercury will be measured. Outfalls with legacy sources and/or abatement activities will be considered for monitoring. Monitoring sites will be identified in the approved WQPP.

4. Reporting of Biological Data

For biological monitoring data, the WQPP report will include raw data, taxa lists, and biometric calculations. Format for the reporting of biological data will be addressed during review of the WQPP.

E. RADIOLOGICAL MONITORING OF DISCHARGES

Monitoring of the radiological content of liquid effluents on the ORNL site shall be specified in the Water Quality Protection Plan. Monitoring will be based on radiological analysis of past and present ORNL operations and monitoring and any additional monitoring specified by the Division. Monitoring under this permit will continue as specified in ORNL's existing Radiological Monitoring Plan until development and implementation of the WQPP. Radiological monitoring established in the WQPP requires sufficient data collection to allow determination and analysis of appropriate parameters to be analyzed and reported for the radiological monitoring program. Requirements for sampling, minimum detectable activities and supporting radiological analyses are included in the WQPP.

F. INSTREAM DATA COLLECTION - MONITORING POINTS X13, X14 AND X15

United States Department of Energy, Oak Ridge National Laboratory, shall monitor flow at in-stream monitoring points as described below:

- at the weir just above the mouth of Melton Branch which is at mile 0.1 and is designated as Outfall X13,
- at the weir on White Oak Creek, mile 1.6, which is designated as Outfall X14, and
- at the White Oak Dam which is designated as Outfall X15 at stream mile 0.6.

Monitoring points designated as Outfalls X13, X14, and X15 shall be monitored in the radiological monitoring plan and reported monthly in the DMR attachments.

RATIONALE

US Department of Energy, Oak Ridge National Laboratory

NPDES PERMIT NO. TN0002941
Oak Ridge, Anderson/Roane County, Tennessee

Permit Writer: Mr. Bob Alexander

I. DISCHARGER

US Department of Energy (USDOE)-Oak Ridge National Laboratory

Official Contact Person:
Mr. Johnny O. Moore
Assistant Manager for Science
Oak Ridge Operations Office
US Department of Energy
P.O. Box 2001
Oak Ridge, TN 37831-8723

Nature of Business

-- basic and applied research and development in key areas of science;

SIC Code(s): 8733
Industrial Classification: Primary
Discharger Rating: Major

PRIMARY INDUSTRY CATEGORY means any industry category listed in the NRDC Settlement Agreement (Natural Resources Defense Council v. Train, 8 ERC 2120 [D.D.C. 1976], modified 12 ERC 1833 [D.D.C. 1979]).

US Dept. of Energy-Oak Ridge National Laboratory

Oak Ridge National Laboratory is the Department of Energy's largest science and energy laboratory. At ORNL, DOE contracts management, and operation research and development activitites as well as management of legacy environmental issues. ORNL was established in 1943 as a part of the secret Manhattan Project to pioneer a method for producing and separating Plutonium. The creation of the Department of Energy in the 1970s led to an expansion of ORNL's research program into areas of energy production, transmission, and conservation.

ORNL has a staff of more than 4,000 and annually hosts approximately 3,000 guest researchers who spend two weeks or longer in the Oak Ridge area. ORNL is in the process of a $300 million project to provide a modern campus for the next generation of great science. A unique combination of federal, state and private funds is building 13 new facilities. Included in these new facilities will be the Laboratory for Comparative and Functional Genomics, the

Center for Nanophase Materials Sciences, the Advanced Microscopy Laboratory, and the joint institutes for computational sciences, biological sciences, and neutron sciences. ORNL has been selected as the site of the Office of Science's National Leadership Computing Facility for unclassified high-performance computing.

Completed in 2006, the $1.4 billion Spallation Neutron Source will make Oak Ridge the world's foremost center for neutron science research.

White Oak Creek, originating in Bethel Valley, and Melton Branch, originating in the Melton Valley, both flow in and around the industrialized areas of ORNL and reflect discharges from current-day and legacy operations.

Environmental Management System

All DOE contractors at ORNL are required by DOE Order 450.1 to implement an Environmental Management System. An EMS allows ORNL staff to identify, assess and control the impacts that ORNL activities and facilities have on the environment. Operations at ORNL are conducted to facilitate excellence and continuous improvement in the environmental aspects of ORNL activities. The EMS involves each onsite organization in planning research and support projects before the work begins, considering safety, environmental and radiological protection issues. Each proposed effort describes potential contaminants and work control processes and undergoes periodic review as the experiment progresses. The programs are addressed facility-wide for waste reduction, and compliance with environmental rules and requirements. The ORNL EMS has been evaluated and accepted into the ISO 14001 registration process in 2004 and into the EPA Performance Track system in 2007.

In recognition of demonstrated examples of environmental excellence, the EPA Performance Track includes opportunities for streamlined regulatory oversight. This program, which is reserved for facilities with outstanding environmental compliance records and mature environmental management systems, offers potential regulatory incentives, such as streamlined permitting, reductions in permit requirements, and reduced numbers of regulatory inspections. ORNL is the seventh Tennessee facility to be accepted into the program. EPA rewards participating businesses by recognizing and publicizing their achievements, managing the exchange of information and ideas and streamlining the compliance process. EPA works with states and other stakeholders to provide specific regulatory and administrative benefits, such as reduced self-reporting and low-priority status for routine federal inspections that are designed to reduce a facility's transaction costs without causing harm to the environment.

The ORNL EMS was certified in August 2004 as conforming to the ISO 14001 standard for environmental management systems by an independent review organization, and is independently audited on an annual basis to verify continued conformance with the standards. In 2007 the ORNL EMS successfully underwent a full recertification audit, which is required every three years under the ISO 14001 process.

ORNL Missions:

ORNL is an international leader in a range of scientific areas that support the Department of Energy's mission. The laboratory's six major mission roles include:

- neutron science
- energy
- high-performance computing
- systems biology
- materials science at the nanoscale
- national security.

II. PERMIT STATUS

NPDES Permit TN0002941 Issued December 6, 1996
Effective Date of February 3, 1997
Appeal filed January 10, 1997
Request for Modification for new outfalls filed June 24, 1999
Expired December 6, 2001
Application for renewal June 1, 2001

In 1997 DOE appealed certain conditions of the NPDES permit including limits for effluent mercury, arsenic and selenium. The appeal resolution process was suspended in 2001 and the issues under appeal are addressed in this renewed permit.

Watershed Scheduling

Environmental Field Office: Knoxville
Primary Longitude: 84.318056 Primary Latitude: 35.92222
Hydrocode: 6010207 Watershed Group: 3
Watershed Identification: Clinch-Lower
Target Reissuance Year: 2013

Spallation Neutron Source - Integrating NPDES Permit

[Excerpt from Updated Permit Application – Dec. 20, 2004]

> "It is anticipated that the SNS Research Facility will begin operation in 2006. The SNS will use proton accelerator technology to generate neutrons for use in various research endeavors. It is anticipated that the SNS will generate wastewaters that will be treated at the PWTC (NPDES Outfall X12) and at the ORNL STP (NPDES Outfall X01). Currently SNS is still under construction, but is already discharging storm water runoff and cooling tower blowdown through two new NPDES Outfalls 435 and 437. The cooling tower blowdown is permitted under a separate NPDES Permit No. TN0077895. The project also discharges storm water through Outfalls 435, 436, and 437. The storm water is currently permitted under Tennessee General Permit No. TNR-10-0000 for Storm Water Associated from Construction Activities. During the life of the next sitewide NPDES Permit, the facility will transition from construction to full operational status and the coverage of the storm water discharges through these outfalls will also need to transition to the sitewide permit."

Outfalls 435, 436, and 437 are incorporated into this permit. Upon issuance of this permit, NPDES Permit No. TN0077895 will be terminated.

III. FACILITY DISCHARGES AND RECEIVING WATERS

This section describes the DOE operations and discharges to surface streams. Major outfalls and stormwater discharges are identified along with receiving stream information and stream use classifications. Brief excerpts describing the major water quality issues are also included for background information. Appendix 1 also provides maps of NPDES outfall locations and surface water quality monitoring points.

A. FACILITY DISCHARGES - General

USDOE-Oak Ridge National Laboratory (ORNL) discharges:

- treated sanitary sewage wastewater
- treated process wastewaters
- ground water, stormwater runoff, and treated wastewater from cleanup of legacy contamination which is managed under the Superfund Act; and
- facilty wastewaters including
    - cooling waters
    - steam condensate and boiler blowdown
    - storm water runoff
    - ground water
    - cooling tower blowdown
    - wastewaters discharged under best management practices

These discharges can contain both radiological and nonradiological compounds and enter White Oak Creek and minor tributaries, all of which are within the Lower Clinch River watershed.

ORNL discharges from current and past operations affect the water quality of surface streams. Despite efforts to treat all wastewater from research processes, to remove and/or isolate legacy contaminants from previous activities, to reroute discharge pipes, and to minimize solids transport in stormwater, discharges from ORNL are a major influence on water quality and flow in their receiving streams.

ORNL discharges contribute specific contaminants to White Oak Creek. Surface water contaminants may include biodegradable material, residual chlorine, volatile organic compounds (VOCs), suspended solids, metals such as copper, mercury, and iron, PCBs, and radionuclides. Many of these contaminants originate from legacy sources which are being addressed through the DOE Environmental Management Program under the Superfund Act. Further detail is provided in Section D. Receiving Waters. ORNL has a total of 168 outfalls and monitoring points (including instream monitoring points):

- 3 outfalls associated with wastewater treatment facilities,
- 150 category outfalls
    - 30 outfalls for process and cooling wastewater and groundwater,
    - 71 outfalls for stormwater, and
    - 49 outfalls discharging stormwater and at least one of the above sources
- 15 instream monitoring points

Numerous outfalls included in the previous permit have been eliminated. Only those outfalls identified in this Rationale are considered currently applicable for effluent limits and/or monitoring requirements.

B. WASTEWATER TREATMENT FACILITIES

There are three (3) wastewater treatment facilities located at the ORNL. These are designated as treatment systems numbered in the X-series and are shown on maps in Appendix 1:

X01 – Sewage Treatment Plant
X02 – Steam Plant Wastewater Treatment Facility (formerly called Coal Yard Runoff Treatment Facility)
X12 – Process Waste Treatment Complex (formerly called Non-radiological Wastewater Treatment Facility)

1. Outfall X01 – Sewage Treatment Plant (STP)

The STP is designed to treat sanitary sewer wastewater generated by the ORNL along with minor amounts of cooling water and infiltration/inflow. In addition to the domestic wastewater, other wastewaters which can be treated biologically may also be treated here. Biological treatment is provided by activated sludge treatment and the plant also employs multimedia filtration, and ozone disinfection. Design flow is 0.3 mgd.

ORNL's sewage sludge is currently dried onsite, stored, and shipped offsite as low-level solid waste to EnergySolutions' disposal facility in Clive, Utah.

DOE recently provided the following information regarding new waste streams which are considered in this permit renewal:

[Excerpt from Updated Permit Application – Dec. 20, 2004]

1. ORNL organizations which perform biological research have, in previous decades, been physically located at the Oak Ridge Y-12 Plant. Since the 2001 application, these organizations have relocated into mostly new buildings on the ORNL Campus. The ORNL Mouse House and support laboratories are located in the 1000 Area in the west campus. The wastewaters generated by these organizations are all conducive to biological treatment.
2. Since the 2001 Application, the SNS facility has been partially completed and staffed with full operational status expected in 2006. In addition to sanitary sewage generated at the facility, wastewaters including condensate from SNS and the associated Center for Nanophase Materials Science (CNMS) are planned to be discharged to the sanitary sewer system.
3. Routing the SNS condensate to the STP instead of to the storm system is a safety measure anticipating that the condensate will occasionally contain some radionuclides such as tritium at concentrations less than DCGs. Tritium is a byproduct of accelerator activity.

The reported flow rates for the sewage treatment plant are 0.21mgd average, 0.73 mgd maximum, 0.092 mgd minimum (1997-2006).

2. Outfall X02 – Steam Plant

The Steam Plant Wastewater Treatment Facility (SPWTF) was previously known as the Coal Yard Runoff Treatment Facility. Significant changes have occurred due to the switch from coal

to natural gas since the previous permit and are described below in the excerpt from the 2004 update.

The Steam Plant treatment system treats water softener regenerant and boiler blowdown. The system is comprised of neutralization and filtration. Flows have dropped substantially from the 0.04 mgd reported in the 2001 application to less than 0.0247 MGD. The SPWTF has an internally administered wastewater acceptance criteria document.

Excerpt from Updated Permit Application – Dec. 20, 2004]

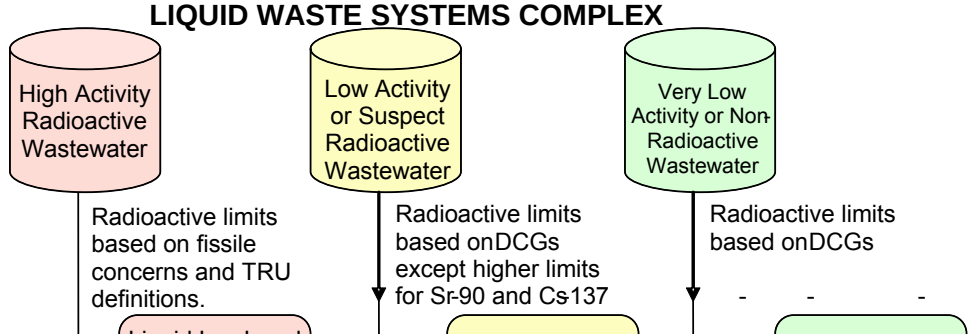
> "The ORNL Steam Plant no longer uses coal fuel, and the coal yard has been removed and restored such that no runoff flows to this treatment facility. The move away from coal has realized both air and water-quality benefits by removing a source of heavy metals. The remaining flows include water softener regenerant and boiler blowdown. Many of the unit operations are not used, but the equipment remains operable until the facility's future is determined. Pertinent treatment operations are now used only to neutralize the wastewater and to filter a slight amount of solids generated during neutralization.

Storm water flow from the former coal yard area was diverted to Outfall 235 in August 2003. Flow records showing the reduced flow are tabulated below:

Outfall X02 Flow Summary before and after elimination of coal yard runoff influent				
Date Range	**Number Values**	**Minimum (MGD)**	**Maximum (MGD)**	**Average (MGD)**
03-Feb-97 to 31-Mar-06	2314	0	0.43923	0.02763
02-Sep-03 to 31-Mar-06	653	0	0.17248	0.0247

3. Outfall X12 – Process Wastewater Treatment Complex (PWTC Buildings 2531, 3544, and 3608)

The PWTC is comprised of three (3) treatment facilities that are interconnected by process waste piping. These three systems are commonly referred to as the Liquid Low-Level Waste System, the Process Waste Treatment Complex – Building 3544 (PWTC-3544), and the Process Waste Treatment Complex – Building 3608 (PWTC-3608). Currently the Liquid Low-Level Waste System is located in Building 2531, the PWTC-3544 located primarily in Building 3544 with a softening process occurring first in Building 3608 , and the PWTC-3608 is located in Building 3608. (Note: Buildings 3544 and 3608 are located in close proximity to one another.) The treatment systems used for processing wastewater depends primarily on the level of radioactive contamination associated with a particular wastewater as best described in the schematic below:



Wastewaters from ORNL operations are accepted and processed in accordance with published Waste Acceptance Criteria.

In addition, wastewaters from ongoing CERCLA remediation projects, contaminated ground water, and leachate from the Environmental Management Waste Management Facility are treated by the PWTC. Some existing and proposed waste sources store accumulated waste onsite for transport via container or tanker to the waste treatment units. Following processing, treated wastewater is discharged to White Oak Creek at Outfall X12 east of Third Street.

In summary:

Name	Location	Function	Waste Type
Liquid Low-Level Waste System	Bldg 2531	LLLW evaporator	radioactive wastewater
PWTC-3544	Primarily Bldg 3544	primarily ion-exchange, softening in Bldg 3608	process wastewater potentially radioactive
PWTC-3608	Bldg 3608	precipitation, filtration, air-stripping and carbon adsorption	low or non-radioactive process wastewater

a. The **Low Level Liquid Waste (LLLW) system** treats the more significantly contaminated radioactive wastewater. The LLLW system consists of collection tanks and piping, waste evaporator facilities, evaporator storage tanks, and Melton Valley Storage Tanks. LLLW is via evaporation, from which the overheads are transferred, via a hard piped connection, to the PWTC-3544 for further treatment.

The concentrate is eventually transferred and stored in a system known as the Melton Valley Storage Tanks, located about a mile south. These Tanks were built and are operated to store both ORNL operational wastes and radioactive waste from CERCLA cleanup projects in Bethel and Melton Valleys.

The Melton Valley Storage Tanks are interconnected with a facility known as the Transuranic Materials Processing Facility (TMPF), which treats and packages the concentrated liquids and sludges generated at ORNL and are classed as low-level liquid (radioactive) wastes. The TMPF provides low-temperature thermal evaporation, stabilization, solidification, and packaging of solid LLW to facilitate shipment to an out-of-state repository. Residual wastes from TMPF are shipped to Nevada and New Mexico for ultimate disposal.

[Excerpt from Updated Permit Application – Dec. 20, 2004]

> "The MPF has been determined to be subject to Permit-By-Rule regulation under CWA section 401 (References 1,2). Therefore, the MPF wastewater treatment units are referenced in this ORNL NPDES Permit application. "

b. **PWTC-3544** - Slightly contaminated wastewater is collected through sink, hood, and floor drains in laboratory and processing areas and transferred to the PWTC-3544 for radionuclide removal by cation exchange. It is optimized for Sr-90 removal but is also effective for Cs-137. Backend treatment via zeolite columns provides additional Cs-137 removal. PWTC-3544 wastewaters are softened prior to cation exchange through a unit located in Building 3608 that is dedicated for radioactive wastewater and is not part of the PWTC-3608 process. This processing step results in the generation of sludge (filter cake), which historically has been, and currently is, being disposed in the Clive, Utah SLLW disposal facility. Current sludge generation from this process is approximately 150 ft^3/week, on the average The PWTC-3544 effluent is then combined with several other liquid waste streams and treated at the PWTC-3608.

Wastewater transferred directly to PWTC-3544 via tanker truck or transport containers is typically added to the softening unit.

Wastewater is typically hard-piped to PWTC-3544 from the Bethel Valley Storage Tanks (F-2101, F-2102, F-2103). PWTC-3544 wastewater from Melton Valley is collected in the Melton Valley Collection Tanks (F-2017, F-2018) and transferred to the Bethel Valley Storage Tanks (F-2101, F-2102, F-2103)

Wastewater hard-piped to PWTC-3544 from Bethel Valley is typically transferred directly to either the Bethel Valley Storage Tanks.

c. **PWTC-3608** – Very low e.g. below DOE's Derived Concentration Guidelines (free release limits) radioactively-contaminated wastewater collected through sink, hood, and floor drains in laboratory and processing areas, as well as the PWTC-3544 effluent, is transferred to the PWTC- 3608. The PWTC-3608 utilizes clarification for heavy metal removal, multi-media filters, an air stripping column for removal of volatile organics, and granular activated carbon adsorption for removal of nonvolatile organics and metals.

Primary contaminants include soluble iron, volatile and non-volatile organic compounds, and strontium, cesium, and tritium. Treatment is provided by air stripping of volatile organics with carbon adsorption for removal of non-volatile organics, some metals, and PCBs. Note that most of the process waste lines to the PWTC-3608 have radionuclide detection monitors that provide alerts so radioactive water can be diverted to the PWTC-3544 if necessary.

[Excerpt from Updated Permit Application – Dec. 20, 2004]

> Recent additions to the system may include waste collection tanks or carboys in new ORNL facilities, which would be installed to provide an alternate mechanism for collection and subsequent transfer of process wastewaters to treatment systems such as above-ground and doubly contained systems. Transfers would typically be via trucked containers, or tanker trucks. Wastewater transferred to PWTC-3608 by tanker truck or transport containers are typically added to Tank F-1002.
>
> Wastewater hard-piped to PWTC-3608 from Bethel Valley is typically added to Tank F-1002 via pump station F-4005 or pump station F-4003. Wastewater hard-piped from

Melton Valley is first collected in Tank F-2019 or 2020 before being transferred to Tank F-1002 located in Bldg 3608.

Building 3608 discharges to White Oak Creek.
Volume: 0.498 mgd average, 1.355 mgd maximum, 0.001 mgd minimum, 1997-2006

C. OTHER OUTFALLS

1. As noted above, ORNL utilizes a large number of outfalls for discharge of process, cooling, stormwater, and groundwater effluents.

Table 1 identifies the ORNL NPDES outfalls in two major categories – with and without stormwater. In the right half of the table, the Non-stormwater summary indicates the type of dry-weather effluent contributing to the discharge:

- process wastewaters includes condensate (HVAC and/or steam) and once-through cooling water;
- groundwater includes foundation drains, building basement sumps and utility pit sumps;
- drains; other includes charcoal filter backwash, aquatic pond overflow, natural springs and pond overflow, etc
- Cooing tower blowdown

Stormwater outfalls are monitored under the existing permit on a rotating basis and are classified according to the type of runoff, potential for discharge of pollutants, volume of flow and other factors. These outfalls will be identified and monitored per the WQPP. More information can be found in this Rationale under Section VII. C. 2.

.

TABLE 1
OUTFALL DISCHARGE TYPES

Stormwater Summary				
Outfalls with Stormwater Only		Outfalls with Stormwater Mixed with Other Discharges		Outfalls Without Stormwater
004	245	001	314	005
010	266	006	341	009
011	268	041	363	014
016	269	043	367	021
017	301	051	368	031
033	342	058	383	052
064	343	065	431	053
070	361	081	434	054
084	362	191	435	055
091	364	203	436	056
101	365	204	437	057
102	403	207	481	085
104	432	210	489	106
107	433	211		171
108	460	214		205
111	461	217		206
113	462	218		212
114	463	219		213
141	464	223		220
142	465	227		222
161	466	231		226
162	467	234		247
164	468	235		261
165	469	241		263
166	470	249		310
168	471	250		311
169	472	262		312
170	473	264		443
208	483	265		447
209	484	267		482
216	485	281		
221	486	284		
224	487	291		
230	488	302		
232	490	304		
243		313		

Non-Stormwater Summary						
Cooling Tower Blowdown	Process Wastewater		Groundwater		Other Non-Stormwater Sources	Unidentified Sources of Water (potable water leaks, etc.)
014	001	250	005	443	051	041
058	006	262	009	447	052	106
191	021	263	021		053	226
204	031	264	043		054	311
249	043	265	081		055	434
267	051	267	085		056	
281	052	281	171		057	
291	053	291	191		247	
304	054	302	205		267	
314	055	304	206		304	
363	056	310	207		313	
367	057	312	211			
435	058	313	213			
437	065	314	214			
481	081	341	217			
	085	363	218			
	191	368	220			
	203	383	222			
	204	431	223			
	207	435	227			
	210	436	231			
	211	437	234			
	212	443	241			
	214	447	249			
	217	482	261			
	218	489	264			
	219		265			
	220		281			
	222		284			
	223		302			
	227		304			
	231		310			
	234		314			
	235		363			
	241		368			
	249		431			

5. Spallation Neutron Source – Outfalls 435 and 437

Outfalls 435, 436, and 437 discharge storm water runoff and cooling tower blowdown. The cooling tower blowdown has been permitted under a separate NPDES Permit No. TN0077895. The storm water is currently permitted under Tennessee General Permit No. TNR100000 for Storm Water Associated with Construction Activities. SNS will also generate process wastewaters that will be treated at the PWTC (NPDES Outfall X12) and at the ORNL STP (NPDES Outfall X01).

6. Instream Monitoring Points

As shown on maps in Appendix 1, ORNL maintains 15 instream monitoring points in White Oak Creek and Melton Branch:

Monitoring Location	Stream Name and Mile	ORNL BMAP Designation
X13	Melton Branch, mile 0.1	MEK 0.2
X14	White Oak Creek, mile 1.6	WCK 2.6
X15	White Oak Creek, mile 0.6	WCK 1.0
X16	First Creek	
X17	First Creek	
X18	Fifth Creek	
X19	Fifth Creek	
X20	Fifth Creek,	
X21	White Oak Creek	
X22	White Oak Creek	
X23	White Oak Creek	
X24	White Oak Creek,	
X25	White Oak Creek	
X26	White Oak Creek	
X27	Melton Branch	

D. RECEIVING WATERS

1. General Description of White Oak Creek and Melton Branch

Most of the Bethel Valley and Melton Valley portions of ORNL are in the White Oak Creek drainage basin, which has an area of 6.4 mile^2 (16.5 km^2). White Oak Creek originates as a series of springs[1] on Chestnut Ridge, north of ORNL, near the Spallation Neutron Source site. Prior to the construction of the SNS Facility, the monitoring station at kilometer 6.8 served as a source of stream background data for ORNL. Field measurements continue to be taken there (D.O., temperature, conductivity, turbidity, and pH), and the Biological Monitoring and Abatement Program takes background water measurements for mercury and performs macroinvertebrate and fish community studies here. Flow, metals, gross alph/beta, gamma scan, carbon-14, and tritium are measured in water.

The predominant geological formation in Bethel Valley (Chickamauga Formation) contributes to a loss in flow below the White Oak Head Waters weir for approximately 0.5-1.0 km White Oak Creek kilometers 5.5 and 6.5. This loss in flow is noticeable as the creek passes under the Bethel Valley Road. A subsurface connection between the creek and the east campus pond has been deduced. Therefore, Upstream of Melton Valley, the primary sources of flow to White Oak Creek excluding effluent discharges, include the East Campus Pond and Fifth Creek within the main ORNL Campus, and First Creek and Northwest Tributary on the west side of the Campus.

Throughout the main plant area the creek riparian zone consists of mowed fescue, small trees, and bushes. A riparian mitigation zone was established in upper First Creek in 1995 and there has been subsequent work to reestablish native grasses in this area as well. Within the main ORNL plant, native vegetation has been encouraged on the creek banks since 1999, so that this narrow band of vegetation is currently providing canopy for the stream. There have been efforts to eradicate invasive plant species throughout the White Oak Creek watershed and to encourage native species.

In Bethel Valley, White Oak Creek flows west along the southern boundary of the main ORNL Campus. It then flows southwesterly through a gap in Haw Ridge (under the 7500 road bridge then past some historic disposal areas undergoing CERCLA remediation which are called solid waste storage areas (SWSAs) into the western portion of Melton Valley, where it forms a confluence with Melton Branch.

Melton Branch is a tributary to White Oak Creek. It originates in the eastern end of Melton Valley and flows into White Oak Creek at kilometer 2.49 just downstream of the weir at monitoring station X14. Except during periods of significant precipitation, the headwater tributaries in Melton Branch become dry each year from about late spring through mid- or late-fall. Flows in lower Melton Branch are perennial, due in large part to discharges from High Flux Isotope Reactor (HFIR).

In the mid-1990s, the major contaminants of concern identified in Melton Valley were three radionuclides: ^{90}Sr, ^{3}H, and sediment-bound cesium (^{137}Cs). Since then, a number of

[1] W. M. McMaster and H.D. Waller, Geology and Soils of Whiteoak Creek Basin, Tennessee, 1965, p. 4

remedial actions have been taken or will be taken with the primary goal of significantly reducing or eliminating inputs of these contaminants into surface waters and ground waters. Major remedial actions that have been taken that could affect inputs of these contaminants into Melton Branch include installment of a multilayer cap on SWSA5, removal of contaminated sediment from the HFIR Ponds, removal of backfill and contaminated soils at the Homogenous Reactor Experiment (HRE) Pond, and installation of down-gradient interceptor trenches to intercept contaminated groundwater from SWSA5. Other actions have included collection and disposal of contaminated soils from contaminant hotspots within Melton Valley, and dredging and restoring ~200 m of Melton Branch about 0.3 km upstream of its confluence with White Oak Creek. Contaminant inputs into surface and ground waters have been monitored to evaluate the effectiveness of actions in achieving the primary goals of remediation (i.e., reduction of contaminant inputs into surface waters and groundwater) since 2003. Monitoring of biological conditions in lower Melton Branch (at stream kilometer location MEK 0.6) was historically carried out as part of BMAP through the mid-1990s. These historical data will be used as the basis of comparison with results from biological monitoring efforts that were initiated in lower Melton Branch in FY06 after the Solid Waste Storage Area (SWSA) 5 interceptor trench and capping were completed.

Both WOC and Melton Branch are influenced by not only ORNL's current operations, but also releases from legacy waste disposal areas.

SWSA 4 is on the west side of White Oak Creek as it flows south from the main plant area and SWSA 5 is on the east side. SWSA 5 borders both White Oak Creek and Melton Branch and the confluence of the two streams is at the southern tip of SWSA 5.

Melton Branch does not receive treated process wastewater discharges but does receive cooling water discharges, releases from CERCLA sites, and storm water runoff. Before the confluence of White Oak Creek and Melton Branch there are two sampling points, X13 on Melton Branch and X14 on White Oak Creek. After the water from these two creeks combine, they enter White Oak Lake, which is an impoundment formed by White Oak Dam.

White Oak Lake detains materials carried downstream within the ORNL site. On the northwest side of White Oak Lake is SWSA 6, the most recent of solid waste storage areas at which radioactive wastes are being stored using various technologies including tumulus technology. The upper edges of the White Oak Lake Reservoir have some wetlands areas. Periodically beavers move into the lake and create more flooded areas on the upstream side of the lake.

Another sampling station, X15, is at the outlet of the White Oak Lake. This is the final sampling point for collecting water data for the creek. The creek flows on to its confluence with the Clinch River where there is a sediment retention structure. The sediment retention structure is an impermeable base with a permeable gabion structure on top through which water flows on its way to the Clinch River. This structure now restricts migration of fish up into White Oak Creek embayment sediment retention structure. Other weirs at the site, such as those at stations X13, X14, and the weir at the 7500 bridge, etc., impede movement of fish from the downstream side to the upstream side of the weirs.

2. Additional information on Melton and Bethel Valley Hydrology

(Note: Some information shown below is extracted from documents prepared under CERCLA in response to listing of the entire DOE Oak Ridge facility on the Superfund National Priorities List.)

Excerpted from the 2006 CERCLA Remedial Effectiveness Report*, Section 4:

> "MV [Melton Valley] is the location of several large waste disposal areas that received waste from over 50 years of operation, production, and research activities at ORNL. MV also served as the U. S. Atomic Energy Commission's (AEC's) Southern Regional Burial Ground for wastes from over 50 other facilities. …p. 4-4
>
> "The CERCLA remediation work in the early and mid-1990s identified that three radionuclides, strontium (^{90}Sr), tritium (^{3}H), and sediment-bound cesium (^{137}Cs), were the contaminants that resulted in the most potential risk to off-site receptors via surface water releases across White Oak Dam WOD. The first CERCLA effort on the ORR, the White Oak Creek Embayment (WOCE) removal action (see Sect. 4.3.1), was designed to quickly stop further releases of sediment-bound cesium from the embayment into the Clinch River. This project was effective at achieving this goal and elevated and stabilized the water levels in the WOCE, thereby reducing the threat of direct contact and exposure to contaminated sediments along the banks of the embayment. …
>
> "In the mid-1990s, three primary release areas in MV were identified as contributing the most strontium releases to WOD: the SWSA 5 Seep C area, the SWSA 5 Seep D, and the SWSA 4 seep area. Three removal actions were initiated at these locations to quickly reduce strontium releases. These interim actions were also instrumental in reducing 3H [tritium] releases. …
>
> "From FY 2003 through FY 2006, all major contaminant source areas are being addressed through a series of CERCLA-driven subproject remedial actions. Once source area actions are complete, efforts will turn to a ROD [Record of Decision] for secondary source areas, such as streambed and lakebed sediments (White Oak Lake (WOL), embayment, and creeks), floodplain soils exhibiting radiation < 2500 μR/hour, and groundwater.
>
> "… Shallow groundwater and surface water are tightly coupled, resulting in a large fraction of infiltrated rainwater (> 95%) that infiltrates the ground and moves to and through the shallow groundwater/surface water system and across WOD (Fig. 4.3). There is a small percentage of water that may intersect groundwater fractures and move along strike through the deeper groundwater system. Because shallow groundwater release to surface water is the primary component of the MV contaminant release model, environmental monitoring in the MV Watershed has focused on surface water, with emphasis on WOD and on the major surface water sites within the watershed. … p. 4-4
>
> *2006 Remediation Effectiveness Report/CERCLA Five-Year Review for the Department of Energy Oak Ridge Reservation, Oak Ridge, TN, March 2006, SAIC, DOE/OR/01-2289&D1.

The table below, excerpted from the 2006 RER, page 4-5, identifies the major CERCLA sources by watershed:

Table 4.2. Surface water subwatersheds in Melton Valley and associated monitoring locations

Subwatershed	Primary subwatershed monitoring location	Primary CERCLA sources	Downgradient source area monitoring locations
Upper White Oak Creek	7500 Bridge Weir	ORNL plant site sources in BV	See Chap. 5
Middle White Oak Creek	WOCWEIR	SWSA 4	SWSA4 SW1 (on line in FY 2006)
		SWSA 4/IHP	WOC Weir
		SWSA 5 North	SWSA5 D1
Melton Branch	MBWEIR	SWSA 5 South	MBWEIR
		HRE Pond	HRT-3, MB5-up
		HFIR Pond	HFIR Seep, MB2
Lower White Oak Creek	WOD	WAG 7 - Trench 7	WCTrib 1
		WAG 7 - Trench 5	East Seep
		WAG 7 - Pits 2,3,4	West Seep, East Seep
		WAG 7 - Pit 1	UWS
		SWSA 6	WAG 6 MS3

BV = Bethel Valley.
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980.
FY = fiscal year.
HFIR = High Flux Isotope Reactor.
HRE = Homogenous Reactor Experiment.
HRT = Homogenous Reactor Test.
IHP = Intermediate Holding Pond.
MB = Melton Branch.
ORNL = Oak Ridge National Laboratory.
SWSA = Solid Waste Storage Area.
UWS = Upper West Seep.
WAG = Waste Area Grouping.
WOC = White Oak Creek.
WOD = White Oak Dam.

The primary Constituent of Concerns (COCs) in the valley are tritium, ^{90}Sr, and ^{137}Cs. Tritium and ^{90}Sr migrate from most of the shallow burial areas of SWSAs 4, 5, and 6. The worst contaminant releases typically originate within trenches that are perennially inundated. Cesium-137 was present primarily in soils of the WOC floodplain, having been deposited on the creekbed through years of process releases from ORNL. The major hazard associated with ^{137}Cs was the potential for direct gamma radiation exposures and sediment-bound migration to the Clinch River. As indicated in Sect. 4.2, the floodplain area with the highest exposure rate was removed in FY 2002 and FY 2003. Alpha emitters, primarily uranium and TRU elements, are present in some locations of the valley. … p. 4-8

Concentrations of mercury in water (measured since 1997 under the ORNL BMAP) exceed the TN water quality criteria for fish and aquatic life at the [White Oak Creek kilometer} WCK 4.1 sampling location just downstream of Fifth Creek which is adjacent to the main campus. Hg concentrations in White Oak Creek downstream of the main ORNL Campus (i.e., WCK 3.4 or the weir at Melton Valley, and White Oak Lake or WCK 1.5) have consistently been lower than the most upstream site monitored, and have less consistently exceeded the State water quality standard. The EM [Environmental Management] CERCLA program also separately samples mercury concentrations in water at the 7500 Bridge and just above the WOC confluence with Fifth Creek. [(Comment: Care has been taken to avoid duplication of biomonitoring efforts (i.e., contaminant monitoring, toxicity testing, and benthic macroinvertebrate and fish

community studies) between compliance and CERCLA funded activities at ORNL, Y-12 and K-25/ETTP.)]

Mercury concentration in fish tissue has also been measured since 1998 at a reference stream (Hinds Creek), White Oak Lake (WCK 1.5), and two sites in White Oak Creek (WCK 2.9 and 3.5) and documented annually in the BMAP report and in the Oak Ridge Reservation Annual Site Environmental Report (ASER). :

> "Three (of 18) fish from the WOC watershed exceeded 0.5 µg/g, the Hg level currently used by the state of Tennessee in issuing fish consumption advisories. Three of six redbreast sunfish from WCK 2.9, and four of six largemouth bass from WCK 1.5 exceeded EPA's Hg fish tissue criterion for methyl mercury of 0.3 mg/kg (ppm): no bluegill collected from WCK 1.5 in 2005 exceeded this level. Mean total Hg concentrations in fish sampled in 2005 were slightly lower than 2004 levels at all sites monitored (Fig. 5.15). Since 1998, a modest increase in Hg concentrations in fish (1.5- to 2-fold) is evident." [2]

PCB in fish tissue are also documented in White Oak Creek in the 2005 ASER:

> "The mean PCB concentrations in sunfish from WCK 2.9 and WCK 1.5 were 0.37 ± 0.07 µg/g and 0.73 ± 0.25 µg/g respectively. These levels are relatively high for short-lived, lipid-poor fish such as sunfish. Largemouth bass from WCK 1.5 typically have substantially higher levels of PCBs and averaged 1.38 ± 0.29 µg/g in 2005. Reference site sunfish analyzed at the same time had average PCB concentrations of <0.03 µg/g. PCB concentrations in stonerollers collected near the main ORNL campus averaged 1.69 ± 0.08 µg/g. Although resuspension of sediments in White Oak Lake and food chain factors undoubtedly affect PCB levels in largemouth bass, the presence of high concentrations of PCBs in stonerollers in WOC near ORNL indicates the likelihood of continuing inputs to the stream." Pg 5-20.

Sources of PCBs are managed under the Toxic Substance Control Act, The Oak Ridge Reservation Polychlorinated Biphenyl Federal Facilities Compliance Agreement.

Fish and macroinvertebrate communities:

Fish and macroinvertebrate community studies in White Oak Creek, First Creek, and Fifth Creek conducted under the BMAP have demonstrated that significant biological recovery has occurred in these streams since the mid-1990s. Most recent results from these monitoring efforts suggest that the rate of biological recovery has slowed, and that mild to moderate ecological degradation remains at downstream locations in these streams.

Background Information on Stream Flow and Water Quality
In the State of TN 2006 303(d) List, White Oak Creek is listed as impaired due to presence of cesium and strontium, and loss of biological integrity due to an undetermined cause. Melton Branch is listed as impaired due to the presence of strontium.

[2] 2005 ASER p. 5-19.

3. Biological Integrity

The condition of biological communities is measured by the use of "biometrics" which interprets existing narrative biological criteria based on regional reference data. Biological criteria are based on macroinvertebrate monitoring at reference streams grouped into bioregions for assessment purposes. Seasonal variability of macroinvertebrate populations is considered and numeric biocriteria are based on a multi-metric index compared to historic targeted and probabilistic monitoring.

TN biocriteria are described in the WPC report Development of Regionally-Based Numeric Interpretations of Tennessee's Biological Integrity Criterion, by Deborah H. Arnwine and Gregory M. Denton, TDEC/WPC, 2006 revision. Areas are identified as ecoregions, which have relatively similar soil, hydrology, vegetation and related characteristics. The report defines this ecoregion as Bioregion 67f, known as Southern Limestone/Dolomite Valleys and Low Rolling Hills, which includes the Lower Clinch River watershed and White Oak Creek.

Scores for White Oak Creek are presented below from TDEC data collected in 2003-2006 at four stations. These data indicate the conditions of White Oak Creek as "Partially Supporting – Slightly to Moderately Impaired" for use by fish and aquatic life. Further information regarding biological criteria is provided in a later section of this permit Narrative under the heading Biological Monitoring and Abatement Program.

2003 Biometric Data:

	White Oak Creek			
METRIC	WCK 6.8	WCK 3.9	WCK 2.9	WCK 2.3
Taxa Richness	32 (6)	19 (2)	21 (4)	28 (4)
EPT Richness	14 (6)	5 (2)	3 (0)	6 (2)
% EPT	64.4 (6)	32.6 (4)	65.9 (6)	15.1 (2)
% OC	12.5 (6)	24.4 (6)	27 (4)	29.3 (4)
NCBI	3.04 (6)	4.47 (6)	3.76 (6)	4.99 (4)
% Dominant	22.1 (6)	20.8 (6)	38.9 (4)	19.5 (6)
% Clingers	57.7 (6)	62.4 (6)	31.4 (2)	23.4 (2)
INDEX SCORE	42	32	26	24

Note: Station WCK 2.9 was replaced by WCK 3.4 in 2003.

2004	36	28	32	32
2005	28	30	30	34

Key:

A - Fully Supporting - Non-impaired…… >= 32
B - Partially Supporting - Slightly Impaired…… 21 - 31
C - Partially Supporting - Moderately Impaired…… 10 - 20
D - Non-Supporting - Severely Impaired…… < 10

2006	34	24	30	34

Stream Flow

For White Oak Creek, the estimated 7Q10 low flow of 1.14 mgd is used in the renewed permit and was also used in the previous permit. For evaluation of recreation criteria, the 30Q2 flow was set at 3.3 mgd, also from the previous permit.

Flow records from stream gages maintained by ORNL for the period 1997 to 2006 are shown below:

Station			Min.	Max.	Average
X13	Melton Branch	mgd	0.05502	43.3144	1.717
X14	White Oak Creek upstream of Melton Br.	mgd	0.03932	113.203	6.467
X15	White Oak Creek at White Oak Dam	mgd	1.96085	184.86	9.601

IV. APPLICABLE EFFLUENT LIMITATIONS GUIDELINES

Effluent guidelines are national standards for wastewater discharges to surface waters for categories of existing industrial sources under Title III of the Clean Water Act. The EPA established effluent limitations guidelines (ELGs) for more than 50 industrial categories - standards are technology-based (i.e. based on the performance of treatment and control technologies) and, as such, are not based on risk or impacts upon receiving waters.

The initial step in determining ELGs is to establish the industrial category into which a facility falls, using Standard Industrial Codes developed by the Census department. SIC codes have historically been applied to activities at the ORNL site: 8731, Commercial Physical and Biological Research, and 8733, Noncommercial Research Organizations, and 8734, Testing Laboratories.

Based on the types of activities reflected by these SIC Codes, there are no federal effluent limitation guideline categories that apply to ORNL activities. Accordingly, effluent limits contained in the renewed permit are based on Best Professional Judgment and, as needed, Water Quality-Based limits.

The facility is one which is defined as having "storm water associated with industrial activity" under the storm water regulations in 40 CFR Part 122.26(b)(14). Therefore, this industry category must meet the applicable storm water requirements in 40 CFR Part 122.26.

V. PREVIOUS PERMIT LIMITS AND MONITORING REQUIREMENTS

Appendix 3 lists the permit limitations and monitoring requirements as defined in the previous permit.

VI. HISTORICAL MONITORING AND INSPECTION

A summary of the data reported on Discharge Monitoring Report forms during 1997 - 2004 is presented in Appendix 3. This summary is prepared with assistance of the staff of Water Quality Program at ORNL. The conclusions reached by reviewing this data summary are presented below with discussions of the proposed permit limits and related monitoring issues.

During the previous permit term, the Division's personnel from the Environmental Field Office - Knoxville performed a Compliance Evaluation Inspection (CEI) of the USDOE-Oak

Ridge National Laboratory. The CEI was performed by Woodson Smith and Allen Wilkinson, Knoxville Field Office and assisted by Kathleen Kitzmiller and John Bain of the TDEC DOE Oversight Division on June 20-21, 2006. The overall conclusion of the inspection report was satisfactory with all operations carried out in a professional manner.

The CEI report addressed recent issues or permit excursions as follows:

- Outfall 081 exceeded the Total Residual Oxidant (TRO) limit twice in July 2005.
- Outfall 281 violated the temperature change limit in August 2005.
- Outfalls 001 and 041 violated the sewage bypass prohibition in November 2005 due to a sewer blockage.
- Outfall X01 violated the NOEC effluent toxicity limit of 12.3% in the May 2005 – confirmatory tests indicated no toxicity.
- A visual inspection of a number of stormwater outfalls and receiving streams reported no major problems.
- Operation and maintenance of dechlorinators was being properly performed.
- Operation and maintenance of wastewater treatment facilities is being properly performed.
- A computer system used for sample tracking and DMR preparation provides daily checks for excursions of NPDES permit limits.

The inspection addressed the Stormwater Pollution Prevention Plan (SWPPP), especially as it pertains to ensuring the compliance of outside entities on the site. ORNL described stormwater controls for ongoing operations and new projects, for which ORNL provides the baseline SWPPP to ensure compliance with facility requirements by project developers. This document is used in conjunction with the Environmental Management System, which serves to document potential impacts, including effects on water quality, before the project begins.

The inspection reviewed the Biological Monitoring and Abatement Program which addresses biological integrity and bioaccumulation issues. The program reports that impacts to benthic macroinvertebrates in certain stream segments had improved in the past but progress toward complete recovery has not been evident in recent years.

The inspection concludes that compliance with this permit is generally acceptable for point source discharges as documented in Appendix 3. Reported effluent monitoring from 1997 to 2004 documented an almost 100% compliance rate for the thousands of parameters reported yearly. However, these water quality impacts are documented in the 303(d) list for Tennessee.

VII. NEW PERMIT LIMITS AND MONITORING REQUIREMENTS

A. OVERVIEW OF PROCEDURES FOR ESTABLISHING NEW PERMIT LIMITS

Permit limitations are set at the most stringent value developed by consideration of the following three factors:

1) consideration of water quality requirements of the receiving waters that will protect all the designated uses for those waters,
2) consideration of a technology-based limit (where applicable). The technology-based limit is determined from EPA effluent limitations guidelines if applicable (see Part IV); or from State of Tennessee maximum effluent limits for effluent limited segments per Rule 1200-4-5-.03(2); or by way of operational and/or treatability data. Furthermore, effluent limitations in this permit must comply with any approved Total Maximum Daily Load (TMDL) studies.
3) Consideration of previous permits limits and the anti-backsliding provisions of 40 CFR Part 122.

Where a pollutant is not covered under regulations and there is no water quality standard or criteria, permit limits may be based on the 96 hour acute toxicity level for that parameter if reliable toxicity data are available for a species that should be present in the receiving waters and that are sensitive to that pollutant. Where treatment systems have been demonstrated or designed to meet a certain level of treatment, the permit limits may be based upon that level of treatment. Otherwise, permit limitations are set at a level determined by the best professional judgment of the permit writer based upon discharges with similar characteristics.

B. PROCEDURES FOR WATER QUALITY BASED EFFLUENT STANDARDS

The following procedure is used to calculate the allowable instream concentrations for permit limitations. If monitoring for a particular pollutant indicates that the pollutant is not present (i.e., consistently below detection level) and that pollutant is not listed under a federal or state guideline, then the division may drop the monitoring requirements in the reissued permit.

1. The most recent background conditions of the receiving stream segment is compiled. This information includes:

   * 7Q10 of receiving stream (1.14 mgd)
   * Calcium hardness (150 mg/l)
   * Total suspended solids (10 mg/l, default)
   * Background metals concentrations (or ½ water quality criteria)
   * Other dischargers impacting this segment (none)
   * Downstream water supplies, if applicable

2. The *chronic* water quality criteria are converted from total recoverable metal at lab conditions to dissolved lab conditions for the following metals: cadmium, copper, lead, nickel and zinc. Then translators are used to convert the dissolved lab conditions to total recoverable metal at ambient conditions.

3. The *acute* water quality criteria is converted from total recoverable metal at lab conditions to dissolved lab conditions for the following metals: cadmium, copper, lead, nickel, zinc, and silver. Then translators are used to convert the dissolved lab conditions to total recoverable metal at ambient conditions for the following metals: cadmium, copper, lead, nickel, silver, zinc, and mercury.

4. The chronic criteria for *Chromium* (T) is given in the total recoverable form and is not converted to a dissolved lab condition or to the total recoverable ambient condition.

5. A standard mass balance equation determines the total allowable concentration (permit limit) for each pollutant. This equation also includes a percent stream allocation of 100%.

The following formulas are used to evaluate water quality protection:

$$Cm = \frac{QsCs + QwCw}{Qs + Qw}$$

Where:

Cw = concentration of pollutant in wastewater
Cm = resulting in-stream concentration after mixing
Cs = stream background concentration
Qw = wastewater flow
Qs = stream low flow
S_A = allocation of stream

To protect water quality:

$$Cw \leq \frac{(S_A)\,[Cm\,(Qs + Qw) - QsCs]}{Qw}$$

CALCULATION OF EFFLUENT LIMITS

Calculations for this permit have been done using a standardized spreadsheet, titled **"Water Quality Based Effluent Calculations"** and are shown in appendix 4.

Division policy dictates the following procedures in establishing these permit limits:

- The critical low flow values are determined using USGS data:

  Fish and Aquatic Life Protection
  7Q10 - Low flow under natural conditions

  Other than Fish and Aquatic Life Protection
  30Q2 - Low flow under natural conditions

- Fish & Aquatic Life water quality criteria for certain Metals are developed through application of hardness dependent equations. These criteria are combined with dissolved fraction methodologies in order to formulate the final effluent concentrations.

- For criteria that are hardness dependent, chronic and acute concentrations are based on a Hardness of 146 and 160 mg/l (from White Oak Creek data) and Total Suspended Solids (TSS) of 10 mg/l, the minimum limit on the TSS value used for water quality calculations.

- Background concentrations are determined from White Oak Creek.

- If the measured background concentration is greater than the chronic “In-stream Allowable” water quality criteria, then the measured background concentration is used in lieu of the chronic “In-stream Allowable” water quality criteria for the purpose of calculating the appropriate effluent limitation (Cw). Under these circumstances, and in the event the “stream allocation” is less than 100%, the calculated chronic effluent limitation for fish and aquatic life should be equal to the chronic “In-stream Allowable” water quality criteria. These guidelines should be strictly followed where the industrial source water is not the receiving stream. Where the industrial source water is the receiving stream, and the measured background concentration is greater than the chronic “In-stream Allowable” water quality criteria, consideration may be given as to the degree to which the permittee should be required to meet the requirements of the water quality criteria in view of the nature and characteristics of the receiving stream.

The spreadsheet has fourteen (14) data columns, all of which may not be applicable to any particular characteristic constituent of the discharge. A description of each column is as follows:

Column 1: The "Stream Background" concentrations of the parameters of concern in the effluent.

Column 2: The "Chronic" Fish and Aquatic Life Water Quality criteria. For Cadmium, Copper, Lead, Nickel, and Zinc, this value represents the criteria for the dissolved form at laboratory conditions. The Criteria Continuous Concentration (CCC) is calculated using the equation:

$$CCC = (\exp \{mC [\ln (\text{stream hardness})] + b_C\}) (CCF)$$

CCF = Chronic Conversion Factor

This equation and the appropriate coefficients for each metal are from Tennessee Rule 1200-4-3-.03 and the EPA guidance contained *in The Metals Translator: Guidance For Calculating A Total Recoverable Permit Limit From a Dissolved Criterion* (EPA 823-B-96-007, June 1996). Values for other metals are in the total form and are not hardness dependent; no chronic criteria exists for silver. Published criteria are used for non-metal parameters.

Column 3: The "Acute" Fish and Aquatic Life Water Quality criteria. For Cadmium, Copper, Lead, Nickel, Silver, and Zinc, this value represents the criteria for the dissolved form at laboratory conditions. The Criteria Maximum Concentration (CMC) is calculated using the equation:

$$CMC = (\exp \{mA [\ln (\text{stream hardness})] + b_A\}) (ACF)$$

ACF = Acute Conversion Factor

This equation and the appropriate coefficients for each metal are from Tennessee Rule 1200-4-3-.03 and the EPA guidance contained in *The Metals Translator: Guidance For Calculating A Total Recoverable Permit Limit From a Dissolved Criterion* (EPA 823-B-96-007, June 1996). Values for other metals are in the total form and are not hardness dependent; no acute criteria exists for Total Chromium. Published criteria are used for non-metal parameters.

Column 4: The “Fraction Dissolved” converts the value for dissolved metal at laboratory conditions (columns 2 & 3) to total recoverable metal at in-stream ambient conditions (columns 5 & 6). This factor is calculated using the linear partition coefficients found in *The Metals Translator: Guidance For Calculating A Total Recoverable Permit Limit From a Dissolved Criterion* (EPA 823-B-96-007, June 1996) and the equation:

$$\frac{C_{diss}}{C_{total}} = \frac{1}{1 + \{[K_{po}] [ss^{(1+a)}] [10^{-6}] \}}$$

ss = in-stream suspended solids concentration [mg/l]

Linear partition coefficients for streams are used for unregulated (7Q10) receiving waters, and linear partition coefficients for lakes are used for regulated (1Q10) receiving waters. For those parameters not in the dissolved form in columns 2 & 3 (and all non-metal parameters), a Translator of 1 is used.

Column 5: The "Chronic" Fish and Aquatic Life Water Quality criteria at in-stream ambient conditions. This criterion is calculated by dividing the value in column 2 by the value in column 4.

Column 6: The "Acute" Fish and Aquatic Life Water Quality criteria at in-stream ambient conditions. This criterion is calculated by dividing the value in column 3 by the value in column 4.

Column 7: The "Chronic" Calculated Effluent Concentration for the protection of fish and aquatic life. This is the chronic limit.

Column 8: The "Acute" Calculated Effluent Concentration for the protection of fish and aquatic life. This is the acute limit.

Column 9: The In-Stream Water Quality criteria for the protection of Human Health associated with the stream use classification of Organism Consumption (Recreation).

Column 10: The In-Stream Water Quality criteria for the protection of Human Health associated with the stream use classification of Water and Organism Consumption. These criteria are only to be applied when the stream use classification for the receiving stream includes both “Recreation” and “Domestic Water Supply.”

Column 11: The In-Stream Water Quality criteria for the protection of Human Health associated with the stream use classification of Domestic Water Supply.

Column 12: The Calculated Effluent Concentration associated with Organism Consumption.

Column 13: The Calculated Effluent Concentration associated with Water and Organism Consumption.

Column 14: The Calculated Effluent Concentration associated with Domestic Water Supply.

The calculated chronic water quality effluent concentrations from Column 7 should be compared, individually, to the values calculated in Columns 12, 13, and 14 in order to determine the most stringent chronic permit limitations. The calculated acute water quality effluent concentrations from Column 8 should then be compared, individually, to values equal to two (2) times the values presented in Columns 12, 13, and 14 in order to determine the most stringent acute permit limitations. These water quality based limits should then be compared to any technology based (CFR or Tennessee "Rules") effluent limitations, and/or any previous permit limitations, for final determination of the permit limits.

C. REVIEW OF EFFLUENT LIMITATIONS FOR EACH OUTFALL

Appendix 4 presents the water quality calculations and Tables X01, X02, and X12 list proposed effluent limitations and monitoring requirements to be included in the new permit. Effluent characteristics limited in the renewed permit along with monitoring requirements are

discussed individually by outfall below. Revisions to monitoring frequencies are shown with applicable parameters.

In the submittal of updated effluent data dated March, 2005, the permittee requested a reduction on monitoring frequencies for selected parameters and outfalls. The justification for the reductions were based upon reported concentrations in Appendix 3 and guidelines presented in "Interim Guidance for Performance-Based Reductions of NPDES Permit Monitoring Frequencies" issued by the US EPA on April 19, 1996.

The Division agrees with the permittee's assertion that all criteria to be used were satisfied when determining if a particular facility is eligible for reductions, and if so, the amount of these reductions,. The facility has demonstrated ability to reduce most pollutants in the discharge well below the level necessary to meet existing permit requirements. The monitoring frequency in itself does not ensure a superior performance of the facility's wastewater treatment system, but is a tool for evaluating compliance with effluent limitations, which are designed to be inherently protective of designated uses of a receiving stream.

Special conditions to address unique situations and special studies, along with other permit conditions for the facility that are not outfall specific, are defined in latter sections of this Narrative. These special conditions deal with chronic mercury contamination, radiological monitoring, biological monitoring, and stormwater.

Backsliding Provisions

For a number of parameters currently being monitored under the previous permit, the permit writer has determined less stringent monitoring frequencies or effluent limitations are justified. In many cases, information on effluent data reported over the last ten years shows concentrations many times less than the existing permit limits and, thus, continuation of the permit limits for the parameter are not warranted.

These determinations conform to EPA rules at 40 CFR 122.44 (l) (B)(1), which states that, when a permit is renewed, less stringent limits may be applied if:

> " Information is available which was not available at the time of permit issuance (other than revised regulations, guidance, or test methods) and which would have justified the application of a less stringent effluent limitation at the time of permit issuance."

Accordingly, elimination of certain parameters based upon these new data obtained since the previous permit is not considered backsliding.

1. Information is available that was not available at the time the permit was issued and that would have justified the application of a less stringent limitation at that time.

High rate of permit limit compliance

In 1986 ORNL was issued an NPDES permit by EPA that included technology-based effluent limits on ORNL's wastewater treatment facilities, cooling towers, and other process-type discharges. In 1996, the ORNL permit was renewed by the Tennessee Department of Environment and Conservation, with water-quality-based effluent limits replacing most of the 1986 technology-based limits. Now, 10 years of NPDES monitoring for compliance with water-quality-based effluent limits (WQBEL) has shown a consistently very high rate of compliance (greater than 99.9%) and in many cases effluent constituents present at concentrations that are either below detection or are orders of magnitude below the WQBELs. In addition, the ORNL wastewater treatment facility effluents have been tested quarterly for toxicity per the NPDES permit

requirements, and in only two of 238 tests has there been any indication of effluent toxicity. Therefore, reductions in monitoring frequencies and in some cases removal of existing effluent limits are considered appropriate for constituents including cadmium, silver, cyanide, nickel, silver, total-toxic-organics, and zinc at certain ORNL NPDES outfalls including Outfalls X01 and X12. Further detail quantifying these determinations is available in Application of EPA's *Interim Guidance For Performance-Based Reduction of NPDES Permit Monitoring Frequencies* to ORNL's NPDES Permit, April 1996.

2. Material and substantial alterations to the facility occurred after issuance of the permit that justify the application of a less stringent limitation

Capacity Increase Project for the PWTC

In 1998, an upgrade to the ORNL Process Wastewater Treatment Complex (PWTC) was completed which resulted in increased throughput capacity and improved water treatment. Specifically, an unused 60,000 gallon clarifier (F-1006) located in the complex at building 3608 was modified by adding a flocculation tank and sludge recycle system, and placed in service. It's predecessor, the L-1 Clarifier, utilized sludge-blanket clarifier technology and had a maximum throughput of approximately 125 gpm, versus approximately 300 gpm allowed by F-1006. The F-1006 reactor-clarifier system resulted in improved effluent water quality, including reduced hardness concentrations and lower concentrations of some radionuclides and many metals.

Elimination of the ORNL Coal Yard

Until 2002, the ORNL Steam Plant was based on a set of coal-fired boilers that were fed from the ORNL Coal Yard, the water runoff from which was treated at the Coal Yard Runoff Treatment Facility and discharged from NPDES Outfall X02. The Steam Plant boilers were converted to burn natural gas rather than coal and in 2002 the ORNL Coal Yard was removed and the underlying soil was remediated to remove coal residues. The Coal Yard Runoff Treatment Facility now treats only boiler blowdown and water-softener regeneration wastewater from the Steam Plant, and has been renamed the Steam Plant Wastewater Treatment Facility. Therefore, monitoring requirements/effluent limits for coal-based constituents e.g. iron, arsenic, mercury, and selenium, have been removed from the permit requirements for Outfall X02.

Control of chlorinated-water effluents

The 1996 ORNL NPDES permit included a requirement for a Chlorine Control Strategy (CCS) to monitor most chlorinated discharges against a mass-loading action level and established instream monitoring points to determine of compliance with chlorine limits. ORNL's chlorinated-water discharges have steadily decreased in significance during the term of the 1996 permit, due largely to efforts to locate and mitigate leaks in underground water-supply pipes, and to the installation and optimization of dechlorination systems, to the point where there is little or no detection of chlorine during the CCS monitoring. As a result, the CCS approach is being continued in the WQPP to include chlorinated water outfalls in Melton Valley, specifically Outfalls 081 and 281, which previously had end-of-pipe chlorine concentration limits. The demonstrated success of the CCS approach in controlling chlorine in Bethel Valley water effluents is being extended to outfalls in other areas of the ORNL site, in place of end-of-pipe chlorine effluent limits. Any detection of chlorine at Outfalls 081 and 281 will trigger the 1.2 grams per day action level in the CCS at typical outfall flow rates for the outfalls.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) progress

In 1996 ORNL areas of legacy contamination had been targeted for remedial action under CERCLA; however, at that time, efforts had been largely investigative. In 1998 the Department of Energy established a new prime contract for conduct of CERCLA remedial actions on the Oak Ridge Reservation. Following the 1998 contract, CERCLA Records of Decision were endorsed by EPA, TDEC, and DOE to address legacy contaminants including radionuclides and mercury, and extensive characterization and cleanup of legacy contamination has taken place at ORNL. Concentrations of legacy pollutants in ORNL surface waters are declining downstream of remediation sites following completion of work. While additional CERCLA remedial work remains to be conducted at ORNL in the coming years, the process has demonstrated effectiveness and continued environmental benefit is expected.

EPA Performance Track and ISO 14001 registrations

In 2000 ORNL committed to the Environmental Management System (EMS) philosophy of operation, a system of planning, assessment, and continuous-improvement for its environmental programs and environmental compliance efforts. The EMS includes site-wide standards and procedures to facilitate environmental protection excellence, in addition to the facility- or organization-specific procedures that are necessary for proper operations. The ORNL EMS has been evaluated and accepted into the EPA Performance Track and the ISO 14001 registration process. In recognition of demonstrated examples of environmental excellence, the EPA Performance Track includes opportunities for streamlined regulatory oversight such as reductions in permit requirements and in frequencies of regulatory inspection.

ORNL is a Pledge Member of Tennessee Pollution Prevention Partnership (TP3)

In 2007, ORNL became a pledge member of the and is the process of applying for membership at the “partner“ level. TP3 is a TDEC voluntary program for industry, schools, and government entities that recognize the importance of a strong pollution prevention program. ORNL, by applying to be a TP3 Partner, committed to reducing our environmental impact in the areas of: air emissions, energy use, hazardous material use, land and water use, and solid waste generation. ORNL has a successful pollution prevention program that is integrated into all activities. In 2006, ORNL pollution prevention projects resulted in the avoidance of over 1,700 metric tons of waste with a cost savings of $3.7 million.

Oak Ridge National Laboratory’s Membership In Environmental Protection Agency’s National Performance Track System

In 2007, the Oak Ridge National Laboratory (ORNL) was accepted into the Environmental Protection Agency's (EPA) National Performance Track program. This program, which is reserved for facilities with outstanding environmental compliance records and mature environmental management systems, offers potential regulatory incentives, such as streamlined permitting and reduced numbers of regulatory inspections. ORNL is the seventh Tennessee facility to be accepted into the program.

ORNL Environmental Protection and Waste Services Division staff are working with EPA and TDEC to determine how these regulatory incentives can best benefit ORNL. Similar to its ISO 14001:2004 EMS registration, Performance Track membership recognizes ORNL's dedication and commitment to environmental leadership.

EPA describes performance incentives, and the Performance Track system, as follows:

Performance incentives encourage businesses to implement better environmental practices. In partnering with businesses, the EPA promotes a systematic approach to managing environmental responsibilities, including taking extra steps to reduce and prevent pollution and being good corporate neighbors. Adopting these practices not only results in environmental excellence - it can also save money and improve productivity. EPA rewards participating businesses by recognizing and publicizing their achievements, managing the exchange of information and ideas and streamlining the compliance process.

Performance Track is a partnership that recognizes top environmental performance among participating U.S. facilities of all types, sizes, and complexity, public and private. Program partners are providing leadership in many areas, including some that are not currently regulated, such as energy use, greenhouse gas emissions, and water consumption. Currently, the program has about 450 members and welcomes all qualifying facilities.

EPA works with states and other stakeholders to provide specific regulatory and administrative benefits, such as reduced self-reporting and low-priority status for routine federal inspections that are designed to reduce a facility's transaction costs without causing harm to the environment. A facility that has been accepted into Performance Track is required to have its environmental management system reviewed per EPA protocol by an outside entity. Facilities may correct minor nonconformances if found in the review, but major nonconformances can cause a facility to become unacceptable for continued Performance Track inclusion.

ORNL's application for Performance Track membership described recent site successes aimed at achieving environmental and pollution prevention excellence beyond the levels required by state and federal regulations and permits. These included:

- maintaining an award-winning Pollution Prevention Program which has facilitated the implementation of over 53 projects reducing over 10,000 metric tons of waste resulting in an associated avoided cost of approximately $12.1 million since 2003; achieving Leadership in Energy and Environmental Design (LEED) engineering certifications for five facilities in the new East Campus Complex;
- participation in the TVA Green Power Switch program (ORNL purchases 650 MWhr per year from renewable energy sources);
- numerous projects to minimize water use and improve water efficiency site-wide for a combined water-use reduction of several million gallons per year, including: replacing once-through cooling water systems with closed loop systems for solvent distillation and nanoparticle and solgel synthesis operations; replacing traditional wet chemistry photographic processes with digital imaging plate systems; modifying a new water jet cutter machine; optimizing boiler wet chemistry to reduce boiler blow down and associated water use; performing a site-wide study of chlorine disinfection by-products in potable water lines to minimize the extent of line-flushing required; maintaining an ongoing project to repair leaks in the existing water distribution system; and installing low-flow toilets and fixtures in the new LEED certified East Campus buildings as well as low-flow retrofits for older buildings; installing a pervious/permeable parking lot and irrigation water collection system as part of the LEED East Campus development project; and utilizing water efficient landscaping (native plant materials which are drought tolerant);
- elimination or reduction of invasive plant species to reduce costs from impacts to infrastructure (power lines, etc.), protect special environmental resources, and preserve the land base required for environmental research. ORNL has developed and implemented an ongoing Invasive Plant Management Plan to

control these invasive plant species, and a habitat restoration plan is being implemented to restore native grass communities and ensure that future landscaped areas are developed with native species. Native grass plantings and invasive plant control efforts have brought the total restored area to 498 acres;

- developing the Conceptual Landscaping Plan and Design Guidelines which are used for ORNL construction and landscaping projects to ensure that a sustainable campus is built "from the ground up".

ORNL has evaluated successful Performance Track memberships at other facilities, to better understand the potential benefits of membership:

- Kodak Colorado near Denver coordinated with Colorado Department of Public Health and Environment to develop a plan for reduced effluent monitoring, based on efficient ambient monitoring and plant performance. Monitoring frequencies for a number of parameters under NPDES were reduced from weekly and quarterly to monthly and annually, respectively.
- Dow Chemical Company in South Charleston, West Virginia worked with West Virginia Department of Environmental Protection and EPA to implement similar programs, including reduced NPDES monitoring frequencies, and reduced frequency of discharge monitoring report submittals from monthly to quarterly.

In the context of the current NPDES permit renewal process, ORNL has proposed to TDEC similar efficiencies, in areas of reduced monitoring and reporting frequencies, where those could be achieved without compromising the ability of the permit to properly regulate ORNL wastewater effluents.

1. – DISCUSSION OF SIGNIFICANT OUTFALLS.

A. Outfall X01 – Sewage Treatment Plant (STP)

The STP discharges to White Oak Creek at the southwest corner of the central campus with a design flow of 0.3 mgd and an average flow of approximately 0.21 mgd. To determine the potential effects on aquatic toxicity, the flow of upstream outfall X12 (0.5 mgd) is added to the background low flow (1.14 mgd) of White Oak Creek and both flows are considered as dilution of Outfall X01. As discussed below, the smaller flow from Outfall X02 is not considered significant to affect Outfall X01.

Effluent data summaries from 1997 to 2006 have been reviewed in preparing the following discussion of relevant parameters.

Existing and proposed permit limits are shown in Table X01 following this discussion.

Carbonaceous BOD5 (CBOD)

Previous permit limits for CBOD as shown in Appendix 2 were 10 and 15 mg/l, measured at 3 times/week. Outfall X01 complies with these limits, having an average CBOD concentration of 5.03 mg/l. The renewed permit will continue to reflect these limits, as well as the daily and monthly quantities. Monitoring frequency will be adjusted to weekly.

Flow

Flow shall be reported as monthly average and daily maximum in Million Gallons per Day (MGD) as shown in Part 1.A of the Permit. Flow will be measured continuously by recorder and reported 3/week on weekdays. Requirements are changed from the previous permit.

Ammonia, as Nitrogen

Limitations for ammonia are set for seasonal values reflecting summer and winter conditions and will be continued. The effluent has consistently met these limits. Monitoring frequency will be adjusted to weekly.

Dissolved Oxygen (DO)

Effluent DO concentrations have averaged 8.89 mg/l in compliance with the permit limit of a minimum DO of 6.0 mg/l. Since DO is an operational parameter as well as a stream concern, monitoring frequency will be retained, but revised from 3/week to weekly.

Total Nitrogen and Total Phosphorus

Quarterly monitoring for Total Nitrogen and Total Phosphorus, in terms of both daily maximum concentration and load, is imposed by EPA in support of the joint State/Federal Mississippi River/Gulf of Mexico Watershed Nutrient Task Force, Action Plan for Reducing, Mitigating, and Controlling Hypoxia in the Northern Gulf of Mexico. Monitoring results from major municipal and industrial facilities discharging within the Mississippi River Basin will help assess current point source loadings to the Gulf and enable the task force to track changes in loadings across the basin in time. Section 308(a) of the Clean Water Act provides broad authority to require information for use in carrying out objectives of the Act even in the absence of reasonable potential for a particular facility to cause or contribute to excursions of criteria within the immediate receiving water body.

Oil and Grease (as Hexane Extractable Material or HEM)

An oil and grease limitation was previously applied to this outfall because oily wastewater was generated from a facility laundry, which has discontinued generating high levels of oily wastes. The limits established at 10 mg/l monthly average and 15 mg/l daily maximum will remain in place using the currently approved method. Of 1422 data points, only 8 have identified oil and grease above the detection level, the average effluent concentration is approximately 6 ppm. Monitoring frequency will be adjusted from 3/week to monthly.

Total Suspended Solids

Previous permit limits of 30 mg/l monthly average and 45 mg/l daily maximum will be retained in the renewed permit. Data for TSS has averaged less than 3 mg/l over the reporting period. Monitoring frequency will be adjusted from 3/week to weekly.

pH

The limitations will be continued within the range of 6.0-9.0. Monitoring history has shown no exceedances in 1420 samples. Monitoring frequency will be adjusted to weekly.

Fecal Coliform criteria changed to E. Coli

Prior to 1999 the Tennessee Rule for General Water Quality Criteria 1200-4-3, contained a monthly average and daily maximum bacteriological criteria for fecal coliform only. In October 1999 the criteria was revised to add a monthly average E. coli standard. Subsequent to that change, many NPDES permits were written to contain effluent limitations and monitoring requirements for both fecal coliform and E. coli. In January 2004, the Water Quality Criteria was changed to remove fecal coliform and add a daily maximum criterion for E. coli. Subsequent to that date, permits requiring bacteriological limits and monitoring have been written for E. coli only. Thus, this permit will replace the fecal coliform limit and monitoring requirement and add a daily maximum limit for E. coli.

The wastewater discharge must be disinfected to the extent that viable coliform organisms are effectively eliminated. The concentration of the E. coli group after disinfection shall not exceed 126 cfu per 100 ml as the geometric mean calculated on the actual number of samples collected and tested for E. coli within the required reporting period. The permittee may collect more samples than specified as the monitoring frequency. Samples may not be collected at intervals of less than 12 hours. For the purpose of determining the geometric mean, individual samples having an E. coli group concentration of less than one (1) per 100 ml

shall be considered as having a concentration of one (1) per 100 ml. A maximum daily limit of 941 colonies per 100 ml applies to recreational waters.

Total Mercury and Methylmercury

Historical data shown in Appendix 3 illustrates that mercury data at this outfall is reported at approximately 200 parts-per-trillion, which is the detection level for EPA Method 245.1. Since fish tissue data for the receiving stream indicate levels above the EPA guideline of 0.3 ppm, all discharges of mercury into White Oak Creek, such as this point-source discharge, must be examined for effects on water quality. The Division recognizes that legacy sources of mercury are the most likely source, and that subsurface drains act as a conduit for mercury releases to surface waters. It is intuitive that mercury which infiltrates subsurface storm drains would also infiltrate sanitary sewers and could potentially be discharged through the sewage treatment plant.

In the renewed permit, monitoring for total and methylmercury will be performed at Outfall X01 twice per month for one year on a composite sample. Analyses for total mercury will use EPA Method 245.7, which has recently been identified by EPA for use in NPDES monitoring. Analyses for Methylmercury will use EPA Method 1630. At the end of one year the monitoring requirement and frequency will be re-evaluated.

Fish tissue reporting from the DOE Biological Monitoring and Abatement Program (described in following sections) will also be used from annual reports to evaluate water quality impacts.

Radioactivity

The outfall will be addressed as part of the WQPP. Gross alpha and gross Beta will continue to be reported on the DMR.

PCBs

As described earlier, White Oak Creek is impaired due to PCB contamination in fish tissue. Data regarding PCB concentrations from Outfall X01 have not been provided with the permit application.

Since fish tissue concentrations indicate the presence of PCB in the White Oak Creek environment and the previous permit did not limit or require monitoring of this parameter, monitoring will be required in the renewed permit. Sampling and analyses for total PCB at a measurement frequency of at least quarterly on a 24-hour composite sample is required. Fish tissue reporting from the DOE Biological Monitoring and Abatement Program will also be used from annual reports (described in following sections) to evaluate water quality impacts.

Heavy Metals (Cadmium, and Silver) and Cyanide

Previous permit requirements for these metals were report-only with no numerical limits. As shown in Appendix 3, historical data on effluent quality has been reviewed. For example, cadmium has been detected in only 8 of 110 samples, cyanide in 17 of 100 samples, and silver in 16 of 110 samples. Maximum reported values are less than the predicted concentrations below.

Reasonable potential for aquatic toxicity due to discharge of these and other metals is described generally in paragraph VII. B above. Predicted values from reasonable potential calculations are shown below and in Appendix 4:

	Calculated	Actual	Max Conc
EFFLUENT CHARACTERISTIC	**X01**		
Cadmium *	**6.16**	**0.38**	**0.50**
Copper *	**155.24**		
Lead *	**122.99**		
Nickel *	**1041.57**		
Silver *	**N/A**	**0.18**	**0.50**
Zinc *	**2898.37**		
Mercury, (T) **	**5.05**	**0.20**	**0.28**
Chromium (T) **	**625.89**		
Cyanide (T) **	**19.41**	**5.97**	**16.00**

Units are ug/l.

This comparison indicates reasonable potential for aquatic toxicity is unlikely and, thus, these parameters will be dropped from the renewed permit for Outfall X01: cadmium, cyanide, and silver.

Toxicity Testing - Chronic

Effluent limits for Biomonitoring Requirements – Chronic will continue from the current permit to the renewed permit for Outfall X01. Adjustments are made to the percent effluent dilutions for Outfall X01 from 41.1 to 69.4%.

Since the permittee discharges to a stream with low critical flow conditions, there is a concern for toxicity effects of the discharge on the receiving stream. Biomonitoring will provide information relative to the toxicity of the discharge. Per TCAC 1200-4-5, permit limits, effluent limitations are required using the LC50 and IC25 criteria as defined in the water quality criteria.

Limitations for LC50 and IC25 are based on the dilution factor, which is calculated as follows:

$$\text{Dilution Factor} = DF = \frac{Qs + Qw}{Qw}$$

where **Qw** is a wastewater flow (Qw = 0.3 MGD) and **Qs** is a receiving stream low flow (1.14 mgd low flow for White Oak Creek plus the upstream flow of 0.5 mgd from Outfall X12 is added). The upstream flow of Outfall X02, which is an intermittent batch discharge of approximately 500 gallons per day, is not considered significant to affect these calculations and is not included. Refer to Appendix 1 for details regarding facility discharge and receiving stream.

Therefore,

$$DF = \frac{1.14 + 0.5 + 0.3}{0.3} = 6.47$$

Since the calculated dilution factor is less than 100:1, and *assuming immediate and complete mixing*, protection of the stream from chronic effects requires calculation of an Instream Waste Concentration (IWC).

The IWC chosen per EPA guidance is the concentration which causes a 25% reduction (Inhibition Concentration 25% or IC_{25}) in survival, growth or reproduction in a biomonitoring test and will effectively become a permit limitation. Where IWC is Instream Waste Concentration and is calculated using the following formula:

$$IWC = IC_{25} = \frac{Qw}{Qs + Qw} \times 100 = \text{Instream Waste Concentration}$$

$$IWC = IC_{25} = \frac{0.3}{1.14 + 0.5 + 0.3} \times 100 = \textbf{15.5 percent} \text{ effluent}$$

Therefore, Whole Effluent Toxicity, or WET testing, will be required on 15.5% effluent at Outfall X01 as a Permit Limit. If toxicity is demonstrated in any of the effluent samples specified above, this will constitute a violation of this permit. Toxicity testing will be performed twice yearly on composite samples.

Toxicity Testing - Acute

The discharge of industrial wastewater from **Outfall X01** may contain several different pollutants, the combined effect of which has a reasonable potential to be detrimental to fish and aquatic life. The Tennessee Water Quality Standards criteria stipulates that "*The waters shall not contain toxic substances, whether alone or in combination with other substances, which will produce toxic conditions...*".

Since the permittee discharges to a stream with low critical flow conditions, there is a concern for toxicity effects of the discharge on the receiving stream, which is relatively unknown. Biomonitoring will provide information relative to the toxicity of the discharge. Calculation of toxicity limits is as follows:

$$DF = \frac{Qs + Qw}{Qw} = \text{Dilution Factor}$$

where **Qw** is a wastewater flow (Qw = 0.3 MGD) and **Qs** is a receiving stream low flow (7Q10 estimated at 1.14 MGD). *For prediction of acute toxicity, inclusion of upstream flow from Outfall X12 is not considered*.

Therefore,

$$DF = \frac{1.14 + 0.3}{0.3} = 4.8$$

Since the calculated dilution factor is less than 500:1, and assuming immediate and complete mixing, protection of the stream from acute effects requires:

$$LC_{50} \text{ of the wastewater must be } \geq \frac{100\%}{DF \times 0.3} = \text{Lethal concentration}$$

$$LC_{50} \text{ of the wastewater must be } \geq \frac{100\%}{4.8 \times 0.3} = 69.4\%$$

Therefore, WET testing (acute) will be required on 69.4% effluent. The toxicity tests specified herein shall be conducted semi-annually (2/Year) for Outfall X01 and begin no later than 90 days from the effective date of this permit. If toxicity is demonstrated in any of the effluent samples specified above, this will constitute a violation of this permit.

Reported effluent toxicity values for LC50 at Outfall X01 for the period 1997-2006 vary approximately 41% to 100%, with an average of approximately 51% as shown in Appendix 3. Only one excursion is reported since 2002, which occurred during an extremely heavy rainfall event. The renewed permit will reflect a change to the effluent limit of survival from 41.1 to 69.4% effluent. Toxicity testing will be performed twice yearly on composite samples.

Details regarding biomonitoring methodology can be found in Part III of the permit.

Total Residual Oxidant

At Outfall X01, the previous permit limits for Total Residual Chlorine is no longer applicable for disinfected sewage discharges since the treatment facility has converted to ozone disinfection. In recent years the TRO monitoring reported at Outfall X01 in the DMR was done to address dechlorinated cooling water from Outfall 235, which mixes with Outfall X01 before discharge to White Oak Creek.

In the renewed permit, TRC is removed from Outfall X01 limits - chlorinated cooling water from Outfall 235 will be addressed by the Chlorine Control Strategy discussed in other sections.

Table X01. Existing and Proposed Effluent Limits and Monitoring Requirements

Effluent Characteristic		Effluent Limitations				Monitoring Requirements	
		MONTHLY		DAILY			
		Avg. Conc. (mg/l)	Avg. Amt. (lb/day)	Max. Conc. (mg/l)	Max. Amt. (lb/day)	Msrmt Frqncy	Sample Type
Flow	Previous		report		report	Daily	Recorder
	Renewed		report		report	3/week	Recorder
pH	Previous	Range 6.0 – 9.0				3/week	grab
	Renewed	Range 6.0 – 9.0				weekly	grab
Total Suspended Solids	Previous	30	57.5	45	86.3	3/week	composite
	Renewed	30	57.5	45	86.3	weekly	composite
CBOD5	Previous	10	19.2	15	28.8	3/week	composite
	Renewed	10	19.2	15	28.8	weekly	composite
Ammonia (as N), Summer	Previous	2.5	6.26	3.75	9.39	3/week	composite
	Renewed	2.5	6.26	3.75	9.39	weekly	composite
Ammonia (as N), Winter	Previous	5.25	13.14	7.9	19.78	3/week	composite
	Renewed	5.25	13.14	7.9	19.78	weekly	composite
Oil & Grease	Previous	10	19.2	15	28.8	3/week	grab
[HEM (Hex. Extr. Matls)]	Renewed	10	19.2	15	28.8	monthly	grab
Dissolved Oxygen	Previous	Min. 6				3/week	grab
	Renewed	Min. 6.0				weekly	grab
Total Residual Chlorine	Previous	0.038		0.066		3/week	grab
	Renewed						
Fecal Coliform	Previous	200		1000		3/week	grab
	Renewed						
E. Coli.	Previous						
	Renewed	126		941		weekly	grab
Gross Alpha	Previous	Report				1/month	Monthly composite
	Renewed	Report				1/month	Monthly composite
Gross Beta	Previous	Report				1/month	Monthly composite
	Renewed	Report				1/month	Monthly composite
Cadmium, Total	Previous			Report		1/month	composite
	Renewed						
Silver, Total	Previous			Report		1/month	composite
	Renewed						
Cyanide, Total	Previous			Report		1/month	grab
	Renewed						
NOEC	Previous	Survival, reproduction, growth in 12.3% effluent				1/quarter	Composite
	Renewed						
IC25	Previous						
	Renewed	Survival, reproduction, growth in 15.5% effluent				1/quarter	Composite
96-hour LC_{50}	Previous	Survival in 41.1% effluent				1/quarter	Composite
	Renewed	Survival in 69.4% effluent				2/year	Composite
Total Phosphorus	Previous						
	Renewed			Report		1/quarter	Composite
Total Kjeldahl Nitrogen (TKN)	Previous						
	Renewed			Report		1/quarter	Composite
Total Mercury	Previous			Report		2/month	Composite
	Renewed	Report		Report		2/month	Composite
Methyl Mercury	Previous						
	Renewed	Report		Report		2/month	Grab
Total PCBs	Previous						
	Renewed			Report		quarterly	Composite

B. Outfall X02 Steam Plant Wastewater Treatment Facility

The Steam Plant Wastewater Treatment Facility (SWTF) was previously known as the Coal Yard Runoff Treatment Facility. Since the treatment system treats only water softener regenerant and boiler blowdown, effluent flows have changed in recent years for an average daily flow of 0.025 mgd. The discharge enters White Oak Creek near the wastewater discharge from Outfall X01.

Effluent data from 1997 to 2004 have been reviewed in preparing the following discussion of relevant parameters. These data indicate excellent performance in meeting limits and reduction in monitoring is approved for certain parameters.

Existing and proposed permit limits are shown in Table X02 following this discussion.

Flow

Flow measurement shall be based on a totalizer flow, recorded daily on workdays, and reported in Million Gallons per Day (MGD) as daily maximum flow for the month and a monthly average flow. Long term average flow is 0.0247 MGD

The discharge of this treatment system is a batch operation when enough boiler blowdown and water softener regenerant have been discharged to the holding pond to warrant running the system. Several days of treatment may occur during a week, or it may be that only one batch will be treated over several days depending on wastewater generation.

pH

pH will be recorded weekly and will be recorded when flow is present. The limitations will be continued within the range of 6.0-9.0.

Oil and Grease (as Hexane Extractable Material or HEM)

Of 473 data points, only 2 have identified oil and grease above the detection level, the average effluent concentration is approximately 5.6 ppm. Accordingly, the oil and grease will be deleted from the renewed permit.

Temperature

During the monitoring period since 1997, the maximum temperature measurement was 28.7 degrees C from 268 analyses. Accordingly, temperature was not required under the previous permit and will not be required under the renewed permit.

Total Suspended Solids

Average TSS concentrations reported weekly are 3.14 mg/l. Previous permit limits of 50 mg/l daily maximum will be retained in the renewed permit. Monitoring frequency will be revised from weekly to once per two months.

Sulfate

Sulfate will be dropped from the permit for this outfall since this concern was due to coal yard runoff.

Iron

Iron is reported at 0.435 mg/L long-term average and is not a concern to surface water quality at this outfall. Iron will be dropped from the permit for this outfall.

Antimony

Long-term effluent concentration of 0.001 mg/L is less than the required detection level of 0.003 mg/l. Accordingly, antimony will be dropped from the permit for this outfall.

Arsenic

DOE appealed permit limits for arsenic in the previous permit established at 0.006 mg/l monthly average and 0.012 mg/l daily maximum. Those limits were established in accordance with TN Water Quality Criteria that were based on EPA criteria subsequently acknowledged by EPA to be flawed.

Since the filing of DOE's appeal, new TN fish and aquatic life water quality criteria for arsenic have been adopted under the Toxic Substances section at Rule 12004-3-.03 (3)(g): 0.15 mg/l Criterion Continuous Concentration and 0.34 mg/L Criterion Maximum Concentration. To calculate the concentration of arsenic necessary to protect water quality in the effluent of Outfall X02 a mass-balance equation is used.

$$Cw = \frac{[Cm\ (Qs + Qw) - QsCs}{Qw}$$

where:
Cw = concentration of Arsenic necessary to protect water quality

Cm = resulting in-stream concentration after mixing
= 0.15 mg/l monthly average
=0.34 mg/l daily maximum
Cs = stream background concentration = 0.004 mg/l
(measured by ORNL during instream monitoring, March 2007)

Qs = stream flow + upstream Outfall X12 = 1.14 mgd + 0.5 mgd= 1.64mgd

Qw = wastewater flow = 0.0247 mgd (batch flow)

Monthly average

$$Cw = \frac{0.15(1.64+0.0247) - 1.64(0.004)}{0.0247} = \frac{0.15*1.645 - 0.00656}{0.0247} = 9.8 \text{ mg/l}$$

Daily maximum

$$Cw = \frac{0.34(1.64+0.0247) - 1.64(0.004)}{0.0247} = \frac{0.34*1.645 - 0.00656}{0.0247} = 22.6 \text{ mg/l}$$

Long-term effluent concentrations of arsenic are reported at 0.003 mg/l (average) and 0.005 maximum. Accordingly, arsenic limits will be dropped for this outfall from the renewed permit.

Selenium

DOE appealed permit limits for selenium in the previous permit established at 0.009 mg/l monthly average and 0.01 mg/l daily maximum. The basis for the DOE appeal was that previous permit limits were established using technology-based limits which have been repealed since 1996.

Since the filing of DOE's appeal, ORNL eliminated the coal yard runoff for treatment and discharge to surface waters. WPC has agreed to utilize existing water quality criteria for selenium adopted under the Toxic Substances section at Rule 12004-3-.03(3)(g): which are 0.020 mg/l Criterion Maximum Concentration and 0.005 mg/l Criterion Continuous Concentration. These criteria are used as the Monthly Average and Daily Maximum to calculate the concentration of selenium necessary to protect water quality in the effluent of Outfall X02 a mass-balance equation is used.

$$Cw = \frac{[Cm\ (Qs + Qw) - QsCs}{Qw}$$

where:
Cw = concentration of selenium necessary to protect water quality

Cm = resulting in-stream concentration after mixing
= 0.005 mg/l monthly average
=0.020 mg/l daily maximum
Cs = stream background concentration = 0.0 mg/l

Qs = stream flow + upstream Outfall X12 = 1.14 mgd + 0.5 mgd= 1.64mgd

Qw = wastewater flow = 0.0247 mgd (batch flow)

Monthly average

$$Cw = \frac{0.005\,(1.64+0.0247) - 1.64(0.0)}{0.0247} = \frac{0.\ 0247*1.645}{0.0247} = 0.337 \text{ mg/l}$$

Daily maximum

$$Cw = \frac{0.20\,(1.64+0.0247) - 1.64(0.0)}{0.0247} = \frac{0.02*1.645}{0.0247} = 1.35 \text{ mg/l}$$

Long-term monitoring concentrations of selenium are reported at 0.006 mg/l average and 0.0115 mg/l maximum. Accordingly, selenium will be dropped from the renewed permit.

Heavy Metals and Cyanide

As shown in Appendix 4, historical data on effluent quality has been reviewed for the following parameters:

- With permit limits: copper, silver, and zinc.
- Monitoring-only: mercury, cadmium, chromium, and lead.

Reasonable potential for aquatic toxicity due to discharge of these metals is described generally in paragraph VII. B above. Predicted values from reasonable potential calculations are shown below.

	Calculated	Actual	Max Conc
EFFLUENT CHARACTERISTIC	**X02**		
Cadmium *	**27.16**	**0.56**	**3.70**
Copper *	**530.31**	**12.80**	**158.00**
Lead *	**519.15**	**0.40**	**8.50**
Nickel *	**5149.80**		
Silver *	**N/A**	**0.22**	**0.70**
Zinc *	**12093.85**	**21.70**	**15.90**
Mercury, (T) **	**35.47**	**0.20**	**0.90**
Chromium (T) **	**4486.72**	**2.60**	**8.10**
Cyanide (T) **	**123.76**	**5.00**	**5.00**

Units are ug/l.

This comparison indicates reasonable potential for aquatic toxicity is unlikely and, thus, all the above parameters will be dropped from the renewed permit for Outfall X02: copper, selenium, zinc, mercury, silver, cadmium, chromium, and lead.

[Note: Effluent data indicates concentrations of total mercury are discharged at 0.00021 mg/l or approximately 210 parts per trillion. These data include results of monitoring during the period when coal yard runoff was included in the samples. Since the discharge currently consists only of water softener regenerant and boiler blowdown, the potential for mercury being present is small. Accordingly, monitoring for mercury from Outfall X02 will be discontinued.]

Conductivity - Parameter to Replace Sulfate

Effluent concentrations of inorganic compounds found in boiler blowdown and/or water softener regenerant can likely create water quality impacts, for example, due to excessive

salinity. Monitoring on a monthly basis for sulfate per the previous permit will be replaced with conductivity reported weekly when a batch discharge occurs during that week. Monitoring for TDS will be conducted as required to calibrate the Conductivity measurements. Units for reporting will be Siemens/m or Siemens/cm.

Toxicity Testing

As stated above under the discussion of Outfall X01, calculations for dilution and effluent toxicity values are presented. For the reduced flow from Outfall X02 from 0.04 mgd to approximately 500 gpd batch discharge, the available amount of dilution in the stream minimizes the potential for aquatic toxicity.

Reported effluent toxicity values in 37 tests for the period 1997-2006 vary for the 48-hr LC50 for Ceriodaphnia from approximately 4.2% to 100% as shown in Appendix 3. These data comply with the previous permit, which required quarterly toxicity testing on composite samples. Accordingly, toxicity testing will be dropped from Outfall X02 for the renewed permit.

Radiological Compounds

Outfall X02 will be addressed as needed in the WQPP. Gross alpha and gross beta values will continue to be reported on the DMR.

Table X02. Existing and Proposed Effluent Limits and Monitoring Requirements

Effluent Characteristic		Effluent Limitations				Monitoring Requirements	
		MONTHLY		DAILY			
		Avg. Conc. (mg/l)	Avg. Amt. (lb/day)	Max. Conc. (mg/l)	Max. Amt. (lb/day)	Msrmt Frqncy	Sample Type
Flow	Previous		report		report	Daily	recorder
	Renewed		report		report	daily (workday)	recorder
pH	Previous	Range 6.0 – 9.0				weekly	grab
	Renewed	Range 6.0 – 9.0				weekly**	grab
Total Suspended Solids	Previous			50		Weekly	composite
	Renewed			50		1/2months	composite
Oil & Grease	Previous	10		15		Weekly	grab
	Renewed						
Gross Alpha	Previous	Report				1/month	monthly composite
	Renewed	Report				1/month	monthly composite
Gross Beta	Previous	Report				1/month	monthly composite
	Renewed	Report				1/month	monthly composite
Sulfate, Total	Previous			Report		1/month	composite
	Renewed						
Iron, Total	Previous	1		1		2/month	composite
	Renewed						
Antimony, Total	Previous			Report		1/month	composite
	Renewed						
Arsenic, Total	Previous	0.006		0.012		2/month	composite
	Renewed						
Cadmium, Total	Previous			Report		1/month	composite
	Renewed						
Chromium, Total	Previous			Report		1/month	composite
	Renewed						
Copper, Total	Previous	0.07		0.11		2/month	composite
	Renewed						
Lead, Total	Previous			Report		1/month	composite
	Renewed						
Mercury, Total	Previous			Report		1/month	composite
	Renewed						
Selenium, Total	Previous	0.009		0.01		2/month	composite
	Renewed						
Silver, Total	Previous			0.008		2/month	composite
	Renewed						
Zinc, Total	Previous	0.87		0.95		2/month	composite
	Renewed						
NOEC	Previous	Survival, reproduction, growth in 1.3% effluent				1/quarter	composite
	Renewed						
96-hour LC_{50}	Previous	Survival in 4.2% effluent				1/quarter	composite
	Renewed						
Conductivity	Previous						
	Renewed			Report		weekly**	grab

C. Outfall X12 Process Wastewater Treatment Facility

[The PWTC was identified in the previous permit as the Non-Radiological Wastewater Treatment Facility.]

The PWTC is comprised of three (3) treatment facilities, as described in more detail in section II.A.3, which are interconnected by process waste piping:

- Liquid Low-Level Waste System,
- Process Waste Treatment Complex – Building 3544 (PWTC-3544), and
- Process Waste Treatment Complex – Building 3608 (PWTC-3608).

The average flow discharged from these systems is approximately 0.5 mgd, released to White Oak Creek near kilometer 4.0, upstream of the sewage treatment plant.

Existing and proposed permit limits are shown in Table X12 following this discussion.

Flow

Flow is reported continuously and reported as the daily maximum and monthly average flow– these criteria will continue in the renewed permit.

Temperature

Effluent data reports no violations of the limit of 30.5 degrees C maximum. Because the temperature effects on this small stream could be significant, monitoring will continue on a at weekly.

Total Suspended Solids (TSS)

TSS monitoring was established in the previous permit for a composite sample. The long term average TSS reported from 1997- 2006 is one (1) mg/l. TSS monitoring will continue at a quarterly frequency on a composite sample on a report-only basis.

Total Toxic Organics (TTO)

TTO limits have been met continuously since 1997 with a long-term average effluent concentration of 0.01 mg/l versus the permit limit of 2.13 mg/l daily maximum. TTO monitoring frequency will be revised from monthly to once annually on a grab sample. Existing permit limits will be revised to a report-only requirement.

Hexane Extractable Materials (HEM - formerly Oil and Grease)

HEM concentrations have averaged less than 6 mg/l over the reporting period, as compared to a permit limit of 10 mg/l monthly average. Monitoring frequency will be revised from weekly to monthly on a grab sample. Existing permit limits will remain the same.

Radioactive Compounds

Outfall X12 will be addressed as needed in the Radiological Monitoring Plan.

Sulfate

Sulfate is not considered a significant impact to water quality from this facility's discharge and will be dropped from the renewed permit.

Iron

Iron is discharged at a long-term average concentration of 0.25 mg/l. Iron will be dropped as a parameter of concern from the renewed permit.

Heavy Metals

Previous permit requirements for these metals included numerical limits. Historical data on effluent quality has been reviewed and compared with the predicted concentrations shown in the following table and the following discussions. Reasonable potential for aquatic toxicity due to discharge of these and other metals is described generally in paragraph VII. B above. Predicted values from reasonable potential calculations are shown below and in Appendix 4:

	Calculated	Actual	Max Conc
EFFLUENT CHARACTERISTIC	**X12**		
Cadmium *	**3.32**	**0.43**	**5.20**
Copper *	**85.98**	**5.80**	**33.30**
Lead *	**63.66**	**1.50**	**13.80**
Nickel *	**533.23**	**1.16**	**5.20**
Silver *	**N/A**	**0.20**	**0.90**
Zinc *	**1545.99**	**28.50**	**107.00**
Mercury, (T) **	**2.64**	**1.00**	**1.70**
Chromium (T) **	**319.34**	**1.90**	**6.30**
Cyanide (T) **	**11.13**	**5.97**	**10.00**

Units are ug/l.

Cyanide

Reported concentrations of 0.005 mg/l are below the permit limits of 0.008 mg/l and maximum reported concentration of 0.01 is well below the daily maximum limit of 0.046 mg/l. As shown in the reasonable potential calculations of Appendix 4, the previous permit limits for cyanide are adequate to protect water quality. Existing permit limits will remain with a revised monitoring frequency from quarterly to once per 6 months on a grab sample.

Arsenic

Reported concentration of 0.001 mg/l is significantly less than the previous permit limits of .007 mg/l monthly average and 0.014 mg/l daily maximum. Existing permit limits were appealed but will remain with a revised monitoring frequency from weekly to once per two months.

Cadmium

As shown in the reasonable potential calculations of Appendix 3, the permit limits for cadmium which are adequate to protect water quality should be 0.003 mg/l monthly average and 0.026 mg/l daily maximum. Reported concentration of 0.0004 mg/l is significantly less than both the calculated limits and previous permit limits of 0.008 mg/l monthly average and 0.034 mg/l daily maximum.

In the renewed permit, the limit for cadmium will be set at 0.003 mg/l monthly average and 0.026 mg/l daily maximum. Monitoring frequency will be revised from weekly to once per two months on a composite sample.

Chromium

Reported concentration of 0.002 mg/l is significantly less than the previous permit limits of 0.22 mg/l monthly average and 0.44 mg/l daily maximum. Per the reasonable potential calculations of Appendix 4, the previous permit limits for chromium are adequate to protect water quality. Existing permit limits will remain with a revised monitoring frequency from weekly to once per two months.

Copper

Reported concentration of 0.006 mg/l is significantly less than the previous permit limits of 0.07 mg/l monthly average and 0.11 mg/l daily maximum. Per Appendix 3, the permit limits for copper which are adequate to protect water quality should be 0.07 mg/l monthly average and 0.116 mg/l daily maximum. Existing permit limits will remain with a revised monitoring frequency from weekly to once per two months.

Lead

Reported average concentration of 0.0015 is significantly less than the previous permit limits of 0.028 mg/l monthly average and 0.69 mg/l daily maximum. Per Appendix 4, the permit limits for lead adequate to protect water quality should be 0.042 mg/l monthly average and 1.15 mg/l daily maximum limit. Existing permit limits will remain with a revised monitoring frequency from weekly to once per two months.

Total Mercury and Methyl Mercury

Historical data shown in Appendix 3 illustrates that total mercury data at this outfall is reported in 8 of 474 samples at 0.0002 mg/L which is the detection level for EPA Method 245.1. Since fish tissue data for the receiving stream indicate levels above the EPA guideline of 0.3 ppm, all discharges of mercury into White Oak Creek, such as this point-source discharge, must be examined for effects on water quality.

In the renewed permit, monitoring for total mercury and methylmercury will be performed at Outfall X12 twice per month for one year on a composite and a grab sample, respectively. Total Mercury will be analyzed using EPA Method 245.7, which has recently been identified by EPA for use in NPDES monitoring, with a detection level of 5 ppt. Methyl mercury will be analyzed using EPA Method 1630. At the end of one year the monitoring requirement and frequency will be re-evaluated.

Fish tissue reporting from the DOE Biological Monitoring and Abatement Program (described in following sections) will also be used from annual reports to evaluate water quality impacts.

Nickel

Long term effluent concentrations of nickel are reported at 0.001 mg/l as compared to the permit limit of 0.87 mg/l monthly average and 3.98 mg/l daily maximum. In addition, the predicted nickel concentration which would affect aquatic toxicity is 335 ug/l and 3494 ug/l, respectively.

Accordingly, nickel monitoring and permit limits will be dropped from the renewed permit.

Polychlorinated Biphenyls (PCBs)

As described earlier, White Oak Creek is impaired due to PCB contamination in fish tissue. Data regarding PCB concentrations from Outfall X12 were not provided with the permit application. Form 2C was marked “Believed Absent” although the system is described as treating PCB wastes from CERCLA projects along with wastes from ongoing research operations.

PCB data is available from monthly monitoring at this outfall under the parameter for Total Toxic Organics. Total PCBs along with 7 PCB arochlors are included in the Toxics comprising a TTO result. The TTO result, not the individual PCB chemical results is reported on the Discharge Monitoring Report.

ORNL data management systems allow access to the individual PCB arochlor and Total PCBs results. ORNL staff has reported that only one detectable result has occurred during 111 monthly sampling events examined. The TTO result from 9/9/98 contained 0.87 ug/l of PCB arochlor 1254 (as compared to a detection limit of 0.5 ug/l). The result did not make the Total PCBs result above the threshold for consideration and the calculated TTO result was below detection.

Based on information from over 9 years of data, the monitoring will be reduced from monthly monitoring for TTO, to quarterly monitoring for TTO which includes total PCB as a means to examine this outfall as contributing to the stream impairment. Annual sampling and analyses for TTO will require grab and composite samples. Coordination with the CERCLA Environmental Management program is also essential to locate and address sources of the PCB impairment.

Calculations such as the mass-balance procedure to determine an effluent limit necessary to protect water quality are not applicable. These calculations are based on water column concentrations as a function of stream and waste flow. For White Oak Creek, the water quality concern for PCBs is attributed more to bioaccumulation than water column concentration. Since the source of PCBs has not been defined, continuation of fish tissue reporting from the DOE Biological Monitoring and Abatement Program remains an invaluable source of data upon which to evaluate water quality impacts.

Selenium

DOE appealed the previous permit for selenium, stating that White Oak Creek is not an "effluent limited", but rather a "water quality limited" stream, and that EPA effluent guidelines should apply instead of state technology-based limits. Since 1996 the state technology-based limits have been repealed. As shown below, the current water quality concern for selenium is significantly lessened:

Calculation of an effluent limit for selenium necessary to protect water quality follows:

$$Cw = \frac{Cm\,(Qs + Qw) - QsCs}{Qw}$$

where:
Cw = concentration of selenium necessary to protect water quality

Cm = resulting in-stream concentration after mixing (TN WQ Criterion)
= 0.020 mg/l daily maximum
= 0.005 mg/l monthly average

Cs = stream background concentration = 0.0 mg/l

Qs = stream flow = 1.14 mgd

Qw = wastewater flow = 0.5 mgd

$$Cw = \frac{0.02(1.14+0.5) - 1.14(0.0)}{0.5} = \frac{0.020*1.64}{0.5} = 0.0656 \text{ mg/l}$$

Cw = 0.066 mg/l daily maximum

Reported effluent concentrations of selenium from 1997 – 2006 are approximately 0.002 mg/l (average) and 0.011 mg/l (maximum). Accordingly, selenium limits will be dropped from the renewed permit.

Silver

Reported effluent concentrations of silver are approximately 0.0002 mg/l. Per Appendix 4, the calculated concentration for acute toxicity due to silver adequate to protect water quality is 0.021 mg/l. Accordingly, silver requirements will be dropped from the renewed permit.

Zinc

Reported effluent concentrations of zinc are approximately 0.027 mg/l, versus an effluent limit of 0.87 mg/l monthly average and 0.95 mg/l daily maximum. Per Appendix 4, the permit limit for zinc which is adequate to protect water quality should be approximately 1,546 mg/l daily maximum. Accordingly, zinc will be dropped from the renewed permit.

pH

Effluent pH values range from 6.8 to 8.4 with no exceedances. The limitations will be continued within the range of 6.0-9.0. Monitoring frequency will be reduced from 3/week to monthly.

Effluent Toxicity - Chronic

Since the permittee discharges to a stream with low critical flow conditions, there is a concern for toxicity effects of the discharge on the receiving stream which is relatively unknown. Biomonitoring will provide information relative to the toxicity of the discharge. Calculation of toxicity limits is as follows:

$$\text{Dilution Factor} = DF = \frac{Qs + Qw}{Qw}$$

where **Qw** is a wastewater flow (Qw = 0.5 MGD) and **Qs** is a receiving stream low flow (1.14 mgd low flow for White Oak Creek. Refer to Appendix 1 for details regarding facility discharge and receiving stream.

Therefore,

$$DF = \frac{1.14 + 0.5}{0.5} = 3.28$$

Since the calculated dilution factor is less than 100:1, and assuming immediate and complete mixing, protection of the stream from chronic effects requires calculation of an Instream Waste Concentration (IWC).

The IWC chosen per EPA guidance is the concentration which causes a 25% reduction (Inhibition Concentration 25% or IC_{25}) in survival, growth or reproduction in a biomonitoring test and will effectively become a permit limitation. Where IWC is Instream Waste Concentration and is calculated using the following formula:

$$IWC = IC_{25} = \frac{Qw}{Qs + Qw} \times 100 = \text{Instream Waste Concentration}$$

$$IWC = IC_{25} = \frac{0.5}{1.14 + 0.5} \times 100 = 30.5 \textbf{ percent effluent}$$

Therefore, WET testing will be required on 30.5% effluent at Outfall X12 as a Permit Limit. The toxicity tests specified herein shall be conducted semi-annually (2/Year) for Outfall X12 and begin no later than 90 days from the effective date of this permit.If toxicity is demonstrated in any of the effluent samples specified above, this will constitute a violation of this permit.

Reported effluent toxicity data for the period 1997-2006 averages >50% effluent for Ceriodaphnia and 50% for Fathead Minnows are shown in Appendix 3. These data comply with the previous permit which required toxicity testing based on quarterly composite samples.

Effluent Toxicity - Acute

The discharge of industrial wastewater from **Outfall X12** may contain several different pollutants, the combined effect of which has a reasonable potential to be detrimental to fish and aquatic life. The Tennessee Water Quality Standards stipulates that "*The waters shall not contain toxic substances, whether alone or in combination with other substances, which will produce toxic conditions...*".

Since the permittee discharges to a stream with low critical flow conditions, there is a concern for toxicity effects of the discharge on the receiving stream, which is relatively unknown. Biomonitoring will provide information relative to the toxicity of the discharge. Calculation of toxicity limits is as follows:

$$DF = \frac{Qs + Qw}{Qw} = \text{Dilution Factor}$$

where **Qw** is a wastewater flow (at Outfall X12, flow Qw = 0.5 MGD) and **Qs** is a receiving stream low flow (7Q10 estimated at 1.14 MGD).

Therefore,

$$DF = \frac{1.14 + 0.5}{0.5} = 3.28$$

Since the calculated dilution factor is less than 500:1, and assuming immediate and complete mixing, protection of the stream from acute effects requires:

Protection of aquatic life from acute effects requires:

$$LC_{50} \text{ of the wastewater must be } \geq \frac{100\%}{DF \times 0.3} = \text{Lethal concentration}$$

$$LC_{50} \text{ of the wastewater must be } \geq \frac{100\%}{3.28 \times 0.3} = 102$$

Therefore, WET testing will be required on 100% effluent. The toxicity tests specified herein shall be conducted semi-annually (2/Year) for Outfall X12 and begin no later than 90 days from the effective date of this permit. If toxicity is demonstrated in any of the effluent samples specified above, this will constitute a violation of this permit.

Reported effluent toxicity data for the period 1997-2006 averages >50% effluent for Ceriodaphnia and 50% for Fathead Minnows are shown in Appendix 3. These data comply with the previous permit which required toxicity testing based on quarterly composite samples.

Details regarding biomonitoring methodology can be found in Part III of the permit.

Radiological Compounds

Outfall X12 will be addressed as needed in the WQPP. Gross alpha and gross beta results will continue to be reported on the DMR.

Table X12. Existing and Proposed Effluent Limits and Monitoring Requirements

Effluent Characteristic		Effluent Limitations				Monitoring Requirements	
		MONTHLY		DAILY			
		Avg. Conc.	Avg. Amt.	Max. Conc.	Max. Amt.	Msrmt Frqncy	Sample Type
		(mg/l)	(lb/day)	(mg/l)	(lb/day)		
Flow	Previous		report		report	daily	recorder
	Renewed		report		report	daily	recorder
Temperature	Previous			30.5°C		weekly	grab
	Renewed			30.5°C		weekly	grab
Total Suspended Solids	Previous			report		1/quarter	composite
	Renewed			report		1/quarter	composite
pH	Previous	Range 6.0 – 9.0				3/week	grab
	Renewed	Range 6.0 – 9.0				1/month	grab
Total Toxic Organics	Previous			2.13	14.2	1/month	grab
	Renewed			report	report	annually	grab
Oil & Grease	Previous	10	66.7	15	100	1/week	grab
[HEM (Hex. Extr. Matls)]	**Renewed**	10	66.7	15	100	1/month	grab
Gross Alpha	Previous	Report				1/month	Monthly composite
	Renewed	Report				1/month	Monthly composite
Gross Beta	Previous	Report				1/month	Monthly composite
	Renewed	Report				1/month	Monthly composite
Sulfate, Total	Previous			Report		1/quarter	composite
	Renewed						
Iron, Total	Previous			Report		1/month	composite
	Renewed						
Cyanide, Total	Previous	0.008	4.33	0.046	8	1/quarter	grab
	Renewed	0.008	4.33	0.046	8	2/year	grab
Arsenic, Total	Previous	0.007		0.014		1/week	composite
	Renewed	0.007		0.014		1/2months	composite
Cadmium, Total	Previous	0.008	1.73	0.034	4.6	1/week	composite
	Renewed	0.003		0.026		1/2months	composite
Chromium, Total	Previous	0.22	11.4	0.44	18.46	1/week	composite
	Renewed	0.22	11.4	0.44	18.46	1/2months	composite
Copper, Total	Previous	0.07	13.8	0.11	22.53	1/week	composite
	Renewed	0.07	13.8	0.11	22.53	1/2months	composite
Lead, Total	Previous	0.028	2.87	0.69	4.6	1/week	composite
	Renewed	0.028	2.87	0.69	4.6	1/2months	composite
Mercury, Total	Previous	0.000019		0.0003		1/week	composite
	Renewed	Report		Report		2/ month	composite
Nickel, Total	Previous	0.87	15.86	3.98	0.87	1/week	composite
	Renewed						
Selenium, Total	Previous	0.01		0.01		1/week	composite
	Renewed						
Silver, Total	Previous		1.6	0.008	2.87	1/week	composite
	Renewed						
Zinc, Total	Previous	0.87	9.87	0.95	17.4	1/week	composite
	Renewed						
NOEC	Previous	Survival, reproduction, growth in 30.9% effluent				1/quarter	Composite
	Renewed						
48-hour LC_{50}	Previous	Survival in 100% effluent				1/quarter	composite
	Renewed	Survival in 100% effluent				1/quarter*	composite
IC25	Previous						
	Renewed	Survival, reproduction, growth in 30.5% effluent				1/quarter*	Composite
Methyl Mercury	Previous						
	Renewed	report		report		2/month	Grab

2. CATEGORY OUTFALL CLASSIFICATION

All 168 category outfalls listed in the previous permit were categorized from I to IV, based on their potential for water quality impacts including stormwater runoff, with Category IV considered the most significant impact. Except for Outfalls 081 and 281, no permit limits were established for these Category I to IV outfalls; instead, the previous permit required monitoring and reporting of flow, pH, and TRC as shown below:

Long-term effluent monitoring shown in Appendix 3 indicates concentrations of TRC in all outfalls currently meet the TRC criteria and pH levels are between 6 and 9. Results of monitoring for stormwater outfalls will be presented in the annual update to the WQPP.

4. WATER QUALITY PROTECTION PLAN

The renewed permit will require ORNL to develop a Water Quality Protection (WQP) Plan to address management of discharges of category outfalls. The requirement for this plan acknowledges two significant factors:

- This regulatory approach to discharges is no less stringent than the previous permit, hence, backsliding is not an issue.
- No significant increase of flows or effluent loads is envisioned; hence, antidegradation is not an issue.

Data from monitoring these outfalls since 1996 has established a clear understanding at almost all outfalls of constituents of concern – these data enable one to discern where repetition of current monitoring and reporting is not fruitful. Rather than prescribing rigid monitoring schedules in the renewed permit, a more flexible approach is warranted whereby ORNL staff develops and implement a WQP Plan to annually assess all outfalls and to focus on significant findings.

The WQP Plan will be prepared for review and approval by the Division incorporating a provision for an annual report with adjustments to the outfall monitoring approach based on the findings. The Division may determine that permit limits would be needed for certain outfalls and would then proceed with a permit modification. Effluent limits for these outfalls are not established.

4. PH MONITORING REQUIREMENTS UNDER THE RENEWED PERMIT

For all outfalls, pH measurements must comply within a range of 6.0 to 9.0, versus a range of 6.5 to 8.5 from the existing permit.

5. COOLING WATER AND TOTAL RESIDUAL CHLORINE

The water balance from the ORNL permit renewal application indicates approximately 1.08 mgd of once-through cooling water are discharged to White Oak Creek and tributaries. This flow represents over 50% of the total discharges from the facility and, without proper management, can create adverse water quality impacts. The source of the chlorine is the potable water from the same distribution system which ORNL obtains from the City of Oak Ridge to supply process, cooling, and drinking water.

Some recirculating cooling systems at ORNL are disinfected with a chlorine/bromine mixture. These cooling tower systems must release cooling tower blowdown, which consists of built-up concentrations of mineral salts, treatment chemicals such as biocides, and other contaminants affecting formation of mineral scale. Analyses of discharges to surface waters from these systems requires testing for Total Residual Oxidant(TRO) , which includes both residual chlorine and bromine, or Total Residual Chlorine (TRC).

Aquatic toxicity concerns at ORNL due to TRC required installation and operation of dechlorination systems. In most cases, these systems have functioned properly such that outfall data indicates TRC concentrations are discharged at or near the detection limit of 0.05 mg/l. This accomplishment is significant considering that almost twenty systems are currently in operation serving multi-story research facilities with complex HVAC systems. This effort represents a substantial commitment by ORNL to operation, maintenance, and oversight of these systems.

The previous permit regulates the discharge of chlorinated water at ORNL by setting: (1) TRO or TRC effluent limits, (2) instream TRO concentrations limits (which are TN water quality criteria), or (3) effluent TRO mass-loading action levels, dependent on the location and magnitude of the discharge. The permit, effective in 1997, also required ORNL to develop a **Chlorine Control Strategy (CCS)** to assess outfalls where chlorine has been detected and provide treatment as needed for removal of TRC.

Key features of the CCS, most recently submitted in August 2007, include:

- Monitor larger sources (Outfalls 210, 314, 249, 267, and 368) weekly and quarterly for a number of other outfalls. Reports submitted to TDEC in July of each year describe control of TRC discharges and have recently found no chlorine detections during monitoring for the previous year.

- Assess outfalls with a significant chlorine load, meaning more than 1.2 grams of chlorine per day. Further actions, such as investigation, removal of chlorine sources, and/or treatment are based on the ongoing assessment.

- Modifications to the Chlorine Control Strategy have been regularly proposed and approved such that exceedances of Total Residual Oxidant (TRO) levels have dropped from 11 in 1998 to 4 in 2001 to zero in 2005.

- The Chlorine Control Strategy also reports on biological monitoring under the ORNL Biological Monitoring and Abatement Program to assess effects on the aquatic community. Changes in monitoring frequency and locations are also discussed in each year's report.

- Permit limits are calculated based on an in-stream criteria of 0.019 mg/l (acute) and 0.011 (chronic) per TCAC 1200-4-3 for streams assigned the Fish and Aquatic Life use classification.

Proposed Outfall Monitoring – TRO/TRC

Monitoring in the renewed permit will consist of routine measurements with limits at twelve (12) in-stream locations. Instream monitoring locations were established in the previous permit because of the impracticality of monitoring numerous small outfalls throughout the ORNL complex. A new in-stream location, X27, on Melton Branch is added. Monitoring locations are: X16 through X27 and are shown on maps in Appendix 1.

The TRC compliance point for Outfalls X01 and 235 is located at a point where the discharges comingle before they reach the receiving stream. Monitoring results are reported on monthly DMRs attributed to Outfall X01; however, only Outfall 235 discharges chlorinated/dechlorinated effluent. Outfall 235 will be monitored for TRO under the WQPP chlorine control strategy and Outfall X01 will not have a TRO or TRC limit or monitoring.

Under the WQPP, remaining outfalls must be assessed for significance toward contributing to chlorine impacts on water quality.

TRC Detection Limit – Revised permit language has been developed as follows: "The acceptable methods for analysis of TRC are any methods specified in Title 40 CFR, Part 136 as amended. The method detection level (MDL) for TRC shall not exceed 0.05 mg/l unless the permittee demonstrates that its MDL is higher. The permittee shall retain the documentation that justifies the higher MDL and have it available for review upon request. In cases where the permit limit is less than the MDL, the reporting of TRC at less than the MDL shall be interpreted to constitute compliance with the permit limit.

Stormwater outfalls are monitored under the existing permit on a rotating basis and are classified according to the type of runoff, potential for discharge of pollutants, volume of flow and other factors. These outfalls will be identified and monitored per the WQPP. More information can be found in this Rationale under Section VII.2.

VIII. MERCURY

Water quality in White Oak Creek is impacted by contamination of soil, groundwater, and stormwater from historic releases at ORNL. This legacy contamination, particularly from mercury, is being addressed by CERCLA remediation managed under DOE's Environmental Management Program. Mercury contamination has caused water column concentrations of total mercury to exceed TN water quality standard of 51 ng/l and caused fish tissue concentrations of methyl mercury to exceed the EPA target of 0.3 mg/kg.

The following excerpt from the USDOE 2007 Remedial Effectiveness Report for the Oak Ridge Reservation summarizes the mercury contamination issue:

> *Mercury is the most significant nonradiological contaminant in WOC in BV. Sampling and analysis for mercury is conducted at the 7500 Bridge station, at the mouth of Fifth Creek, and at a location in WOC south of Building 4508.* [Note: this coincides with Outfall 211 discussed below.] *Data from 7500 Bridge show that during FY 2006 mercury concentrations exceeded the recreation—organisms only [Ambient Water Quality Criteria] AWQC of 51 ng/L in samples collected in December, February, July, and September.*
>
> *Table 2.9 summarizes average and maximum detected mercury concentration at the 7500 Bridge. Mercury concentrations at 7500 Bridge have varied significantly since routine sampling commenced in FY 2001. The highest average and maximum concentrations were measured in FY 2001 followed by results of FY 2005. During FY 2003 the high runoff from record high rainfall caused the average and maximum mercury concentrations at 7500 Bridge to be lower than typical.*
>
> *Although several locations in the ORNL main plant area are mercury contaminated, the primary source of mercury that impacts WOC is at Building 4501 where a spill of approximately 20,000 pounds occurred in the 1950s. Mercury is captured in the basement foundation dewatering sumps and some of the sump water is discharged to WOC. The BV ROD* [Record of Decision] *includes reconfiguration of piping and treatment of all contaminated Bldg. 4501 sump water to eliminate the discharge of mercury contaminated groundwater to WOC.*
>
> Reference: USDOE, 2007 Remedial Effectiveness Report, Ch. 2.

Table 2.9

7500 Bridge mercury concentration

Year	Average (ng/L)	Maximum (ng/L)	Annual Rainfall (in.)
2001	291	777	44.3
2002	89	264	55.0
2003	29	63	73
2004	53	241	57.6
2005	111	616	57.9
2006	67	515	46.7

ng/L = nanogram per liter

In WOC, mercury and polychlorinated biphenyl (PCB) concentrations in fish are at or near risk thresholds. Mean mercury concentrations in fish collected in the WOC system in 2006 are within historical ranges (Fig. 2.11), although mean mercury concentration in sunfish at White Oak Creek Kilometer (WCK) 2.9 exhibited higher concentrations than has been typical recently. Mercury in sunfish further upstream at WCK 3.9 averaged 0.32 ± 0.03 µg/g.

ORNL is planning as of this writing to identify and eliminate approximately 35% of the mercury flux to White Oak Creek from the Buildings 4501/4505 foundation drains. These drains are currently pumped to the storm drain discharging to White Oak Creek at Outfall 211. Outfall 211 discharges to WOC just upstream of the confluence with Fifth Creek, as shown in Appendix 1, and includes stormwater, cooling water, and condensate in addition to the contaminated groundwater. Concentrations of total mercury at Outfall 211 are reported from 200 to 1980 ng/l.

The proposed mercury removal is to be accomplished by rerouting groundwater flow from the sump, pretreating and connection to process waste piping to the Process Waste Treatment Complex – 3608, for final treatment and discharge at Outfall X12. Reduction of the foundation sump of approximately 5 million gallons per year of cooling water is also planned.

Proposed pretreatment of the contaminated groundwater from Bldg. 4501/4505, along with the PWTC treatment process, would result in an estimated 75-80% mercury removal efficiency.

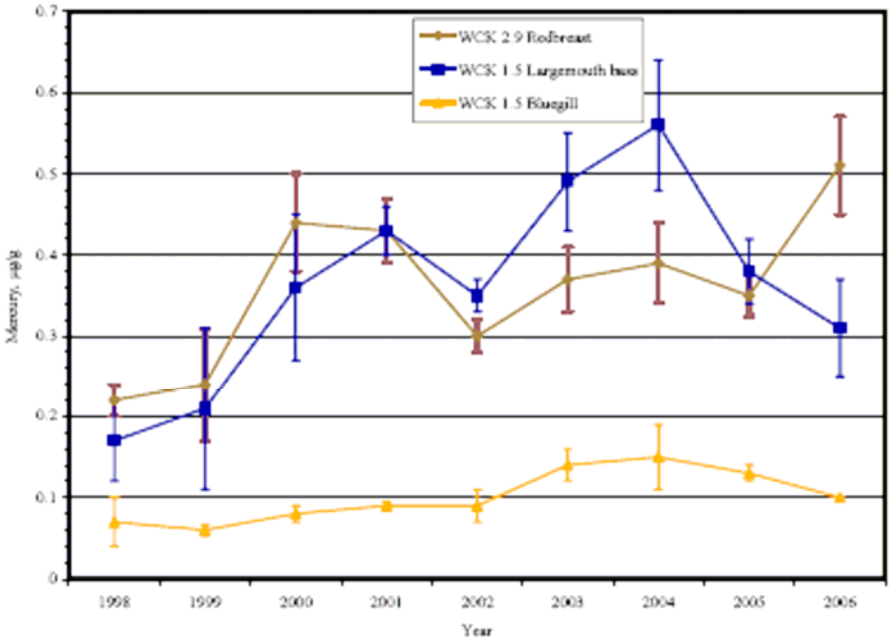


Fig. 2.11. Mean concentrations of mercury (± SE, N = 6) in muscle tissue of sunfish and bass from White Oak Creek (WCK 2.9) and White Oak Lake (WCK 1.5), 1998–2006.

IX. WASTEWATER CONTROL

The permittee shall provide the Division a description of the procedures and criteria used to determine which wastewaters are routed to which treatment system.

The report describing these procedures shall include whatever safeguards are in place to prevent introduction of wastewaters into a treatment system which are not appropriate for treatment. The report should also describe how a wastewater would be evaluated if it is of unusual character or different than what has been historically handled by the treatment systems. This description shall include a description of record-keeping and documentation of this process. The report should include a list of parameters sampled and frequency of monitoring to demonstrate operational control of watewater treatment operations.

X. ANTIDEGRADATION

Tennessee's Antidegradation Statement is found in the Rules of the Tennessee Department of Environment and Conservation, Chapter 1200-4-3-.06. The purpose of this provision is to protect existing uses and prevent degradation of high quality waters. The rule states that:

> "Where the quality of Tennessee waters is better than the level necessary to support propagation of fish, shellfish, and wildlife, and recreation in and on the water, that quality will be maintained and protected unless the state finds that, after intergovernmental coordination and public participation, that lowering water quality is necessary to accommodate important economic or social development in the area in which the waters are located."

Evaluation of compliance with this rule shall be made on an individual parameter (pollutant) basis considering such factors as:

1. The discharge quantity and/or pollutant loading represents a new condition, an expanded condition, or an existing condition;
2. The receiving stream has unavailable conditions (is at or exceeds water quality criteria), available conditions (quality is better than the water quality criteria) or is defined as an Exceptional Tennessee Water or Outstanding Natural Resource Water;
3. The discharge impact on the assimilative capacity of the receiving stream is considered *de minimus* or not *de minimus*.

The ORNL discharges are historically existing discharges and this permit renewal includes no new or expanded flow quantity or pollutant loadings. Over the past permit cycles the volume flow discharge and pollutant loadings from this facility have been steadily reduced through elimination of outfalls and improved treatment . Therefore, the discharges in this permit are not subject to alternatives analysis or socio-economic considerations under the antidegradation rule.

XI. PERMIT DURATION

The proposed limitations meet the requirements of Section 301(b)(2)(A), (C), (D), (E), and (F) of the Clean Water Act as amended. We intend to organize the future issuance and expiration of this particular permit such that other permits located in the same watershed and group within the State of Tennessee will be set for issuance and expiration at the same time. In order to meet the target reissuance date for the Clinch-Lower watershed and following the directives for the Watershed Management Program initiated in January, 1996, the permit will be issued in 2007 with a Permit Effective Date set sometime in January, 2008 to coincide with the Watershed Cycle for Lower Clinch River. The Expiration Date will be set for January 2013 to establish the 5-year permit duration and remain within the watershed cycle.

APPENDIX 1

FACILITY DISCHARGES AND RECEIVING WATERS

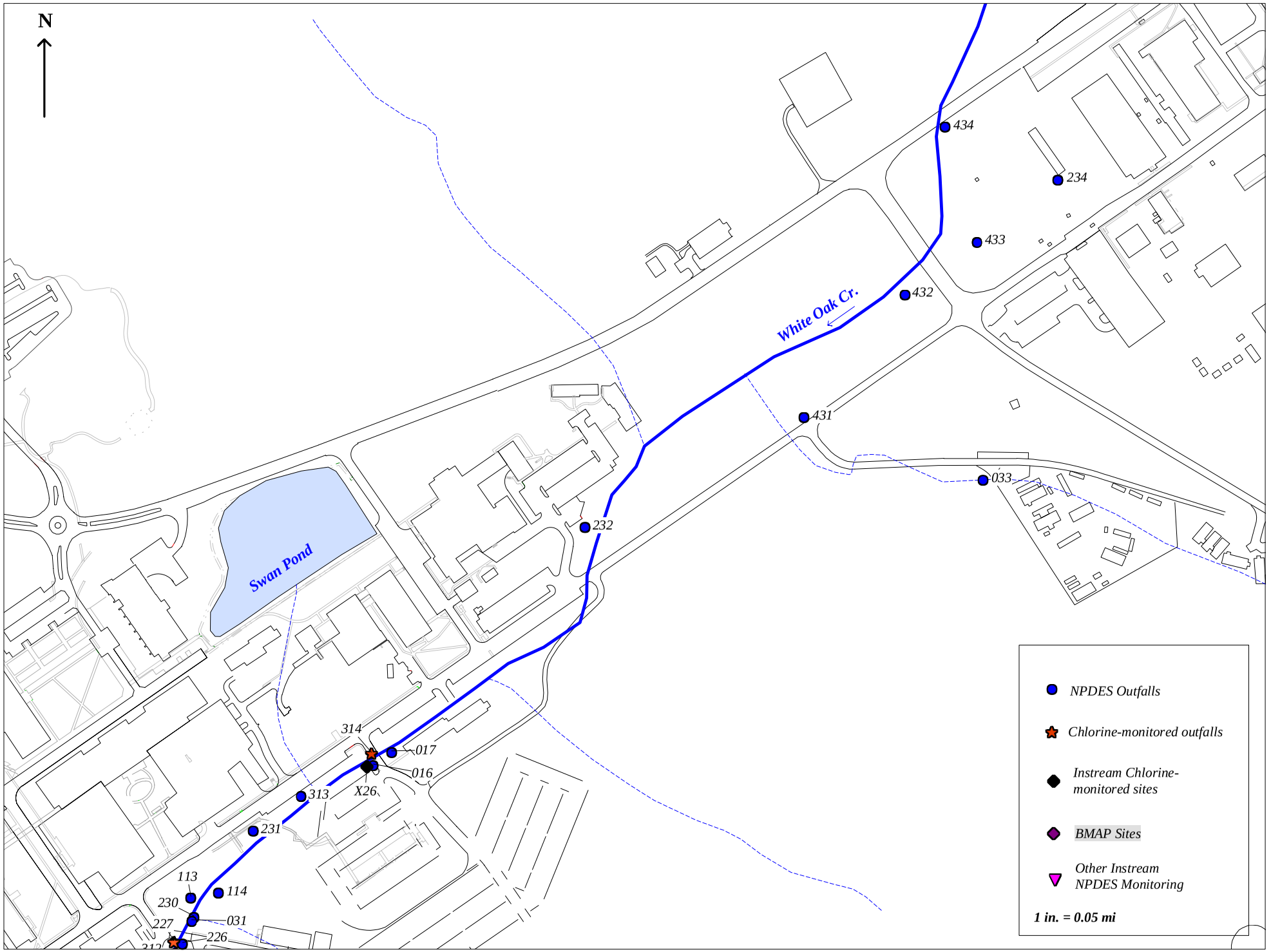
FACILITY DISCHARGES AND RECEIVING WATERS

OUTFALL X01	
LONGITUDE	**LATITUDE**
84-15-35	35-59-02

RECEIVING STREAM DISCHARGE ROUTE
White Oak Creek and Melton Branch

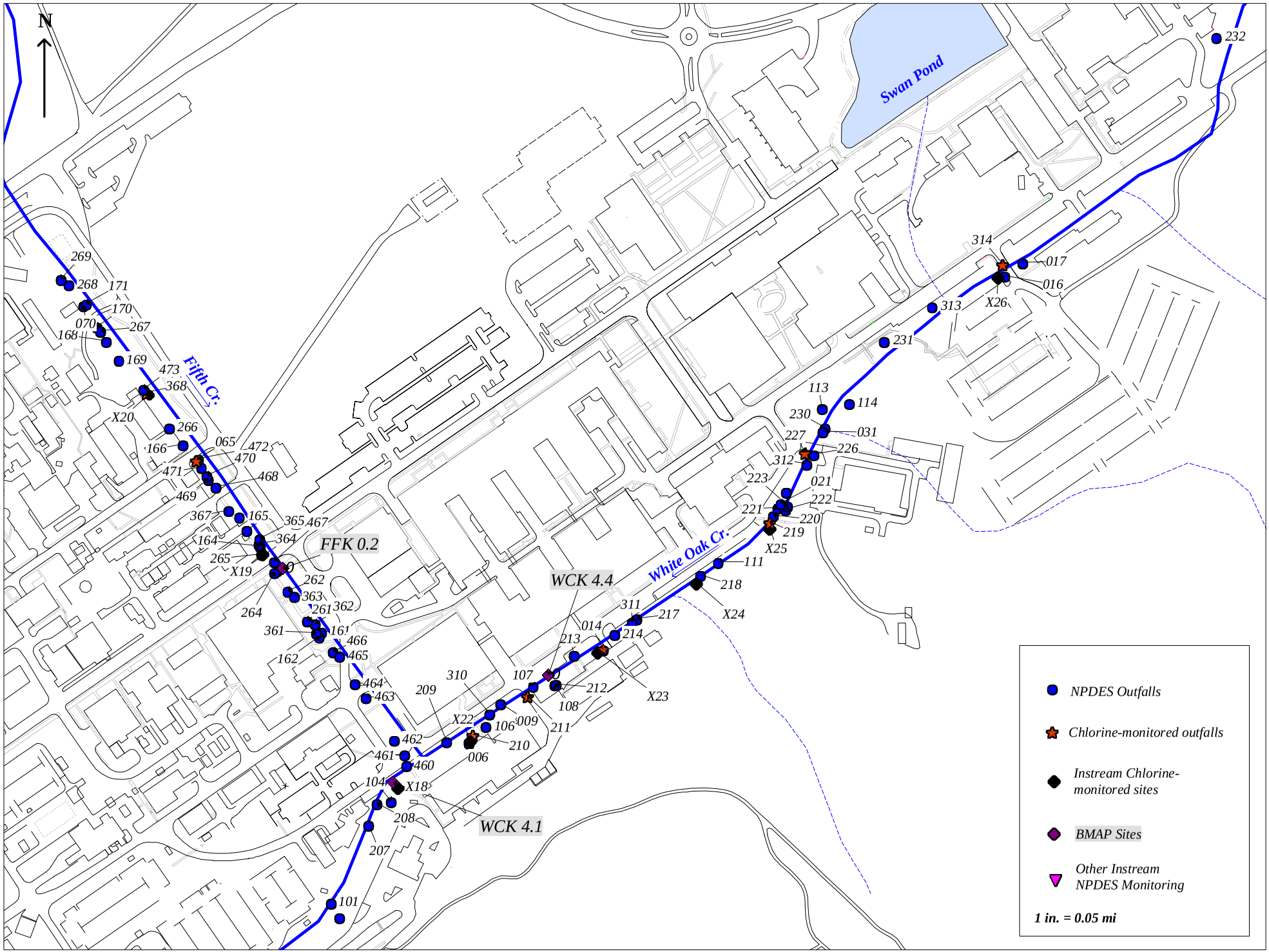
STREAM USE CLASSIFICATIONS			
FISH & AQUATIC LIFE	RECREATION	IRRIGATION	LIVESTOCK & WILDLIFE
X	**X**	**X**	

FLOW (MGD)	**DISCHARGE SOURCE**
1.7950	Process wastewater, stormwater, ground water, and cooling water
1.7950	**TOTAL DISCHARGE**



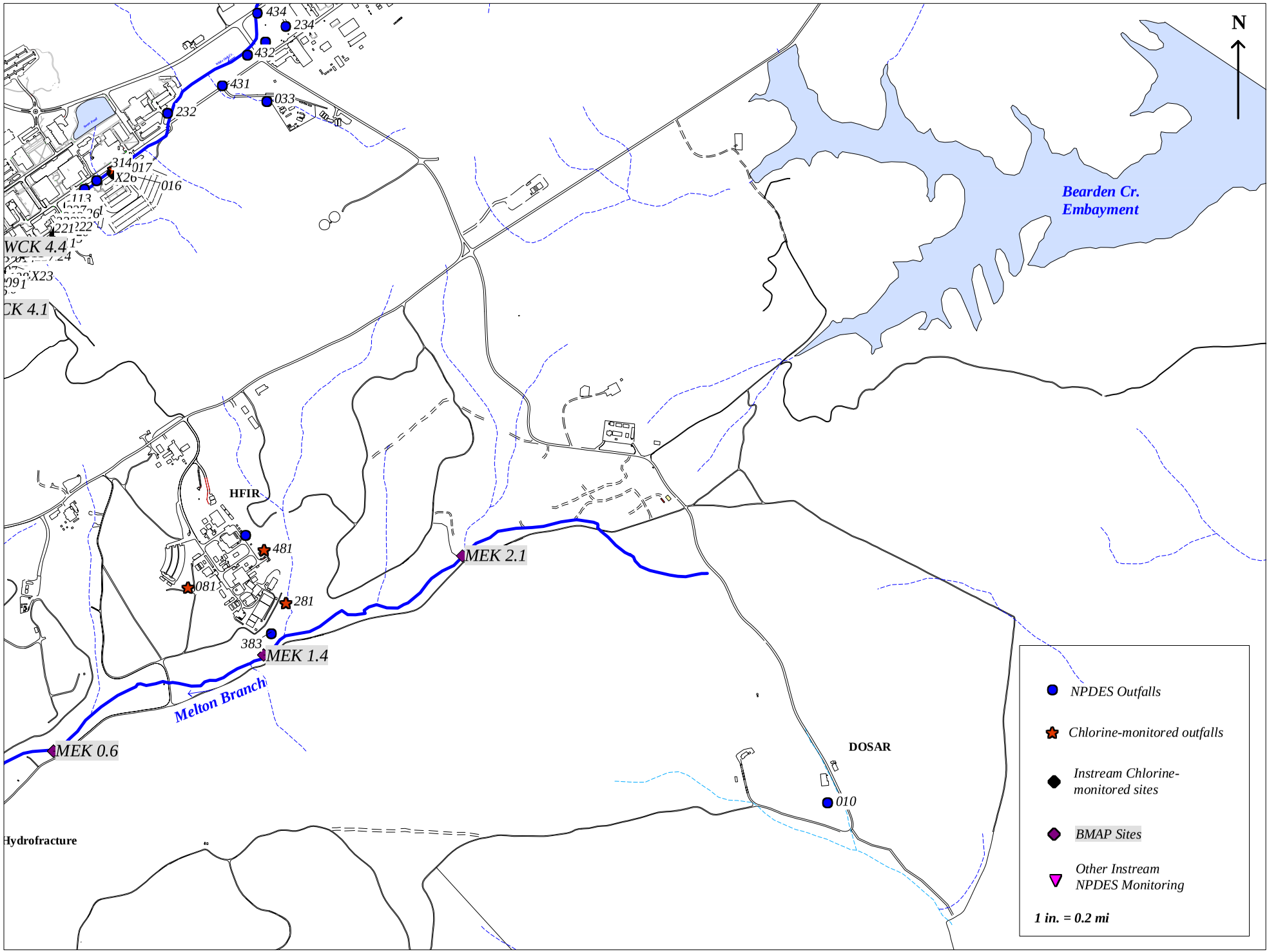
ORNL Outfalls and Monitoring Points

May, 2007



ORNL Outfalls and Monitoring Points

May, 2007



ORNL Outfalls and Monitoring Points

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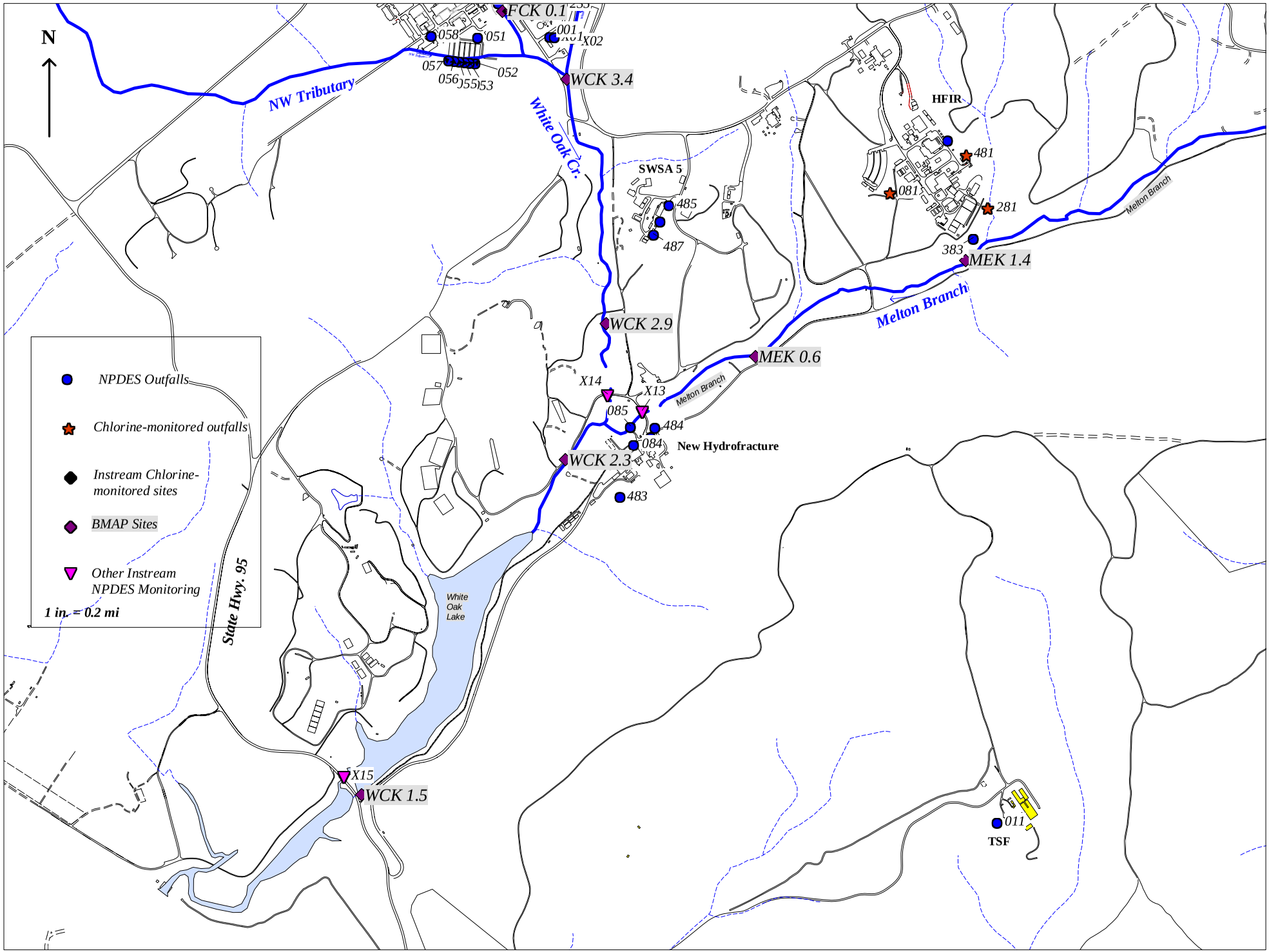

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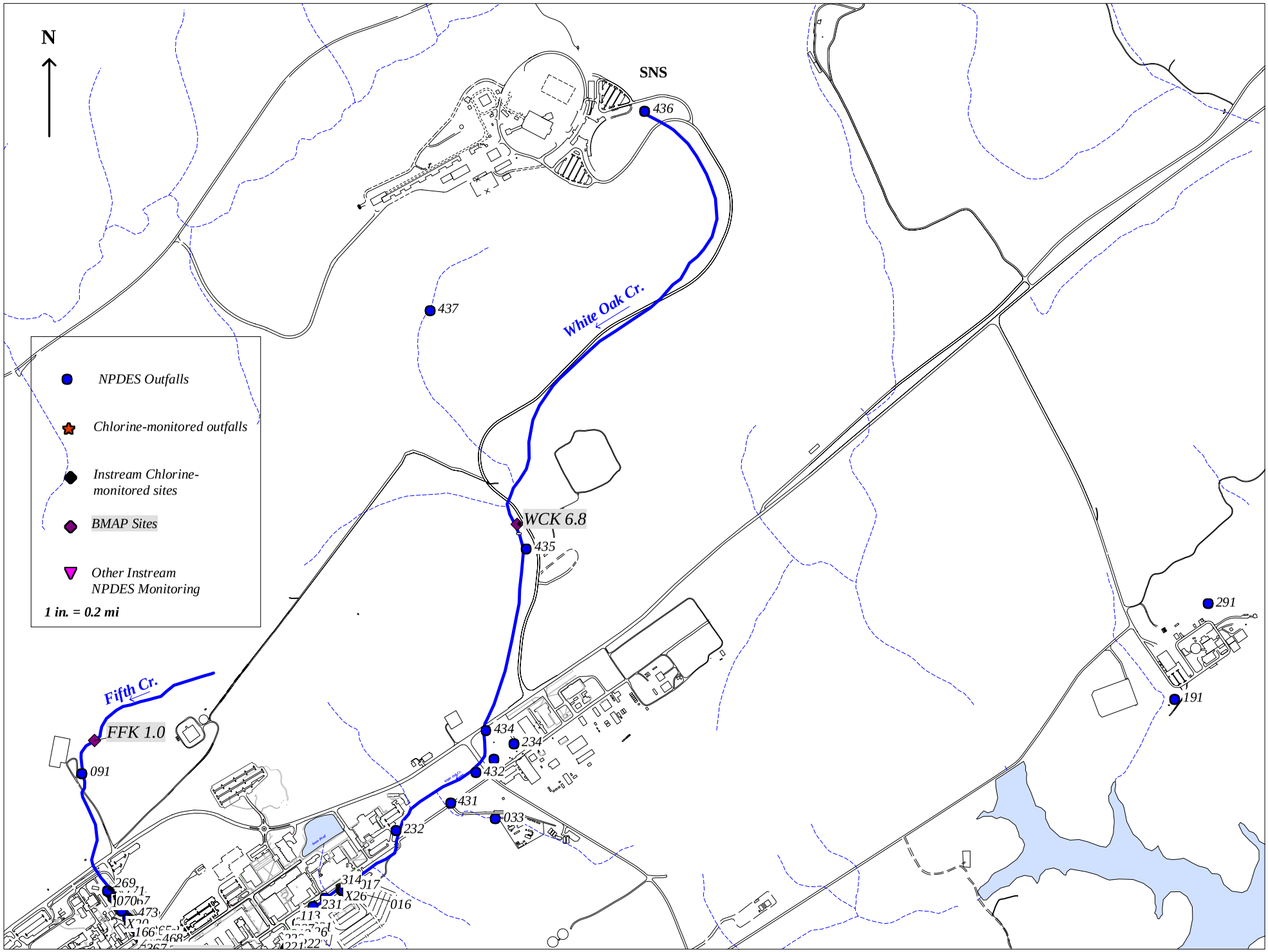

ORNL Outfalls and Monitoring Points

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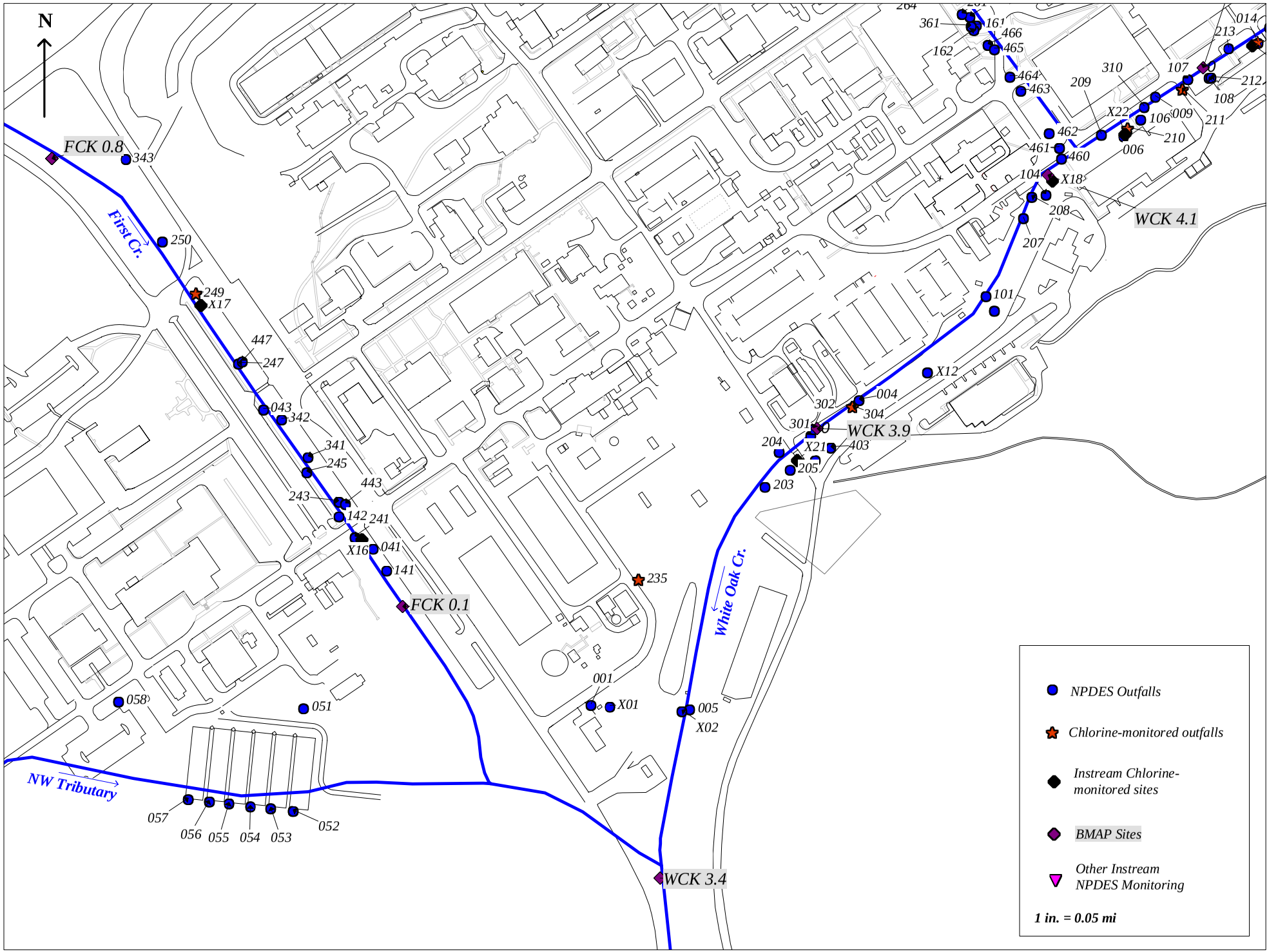

ORNL Outfalls and Monitoring Points

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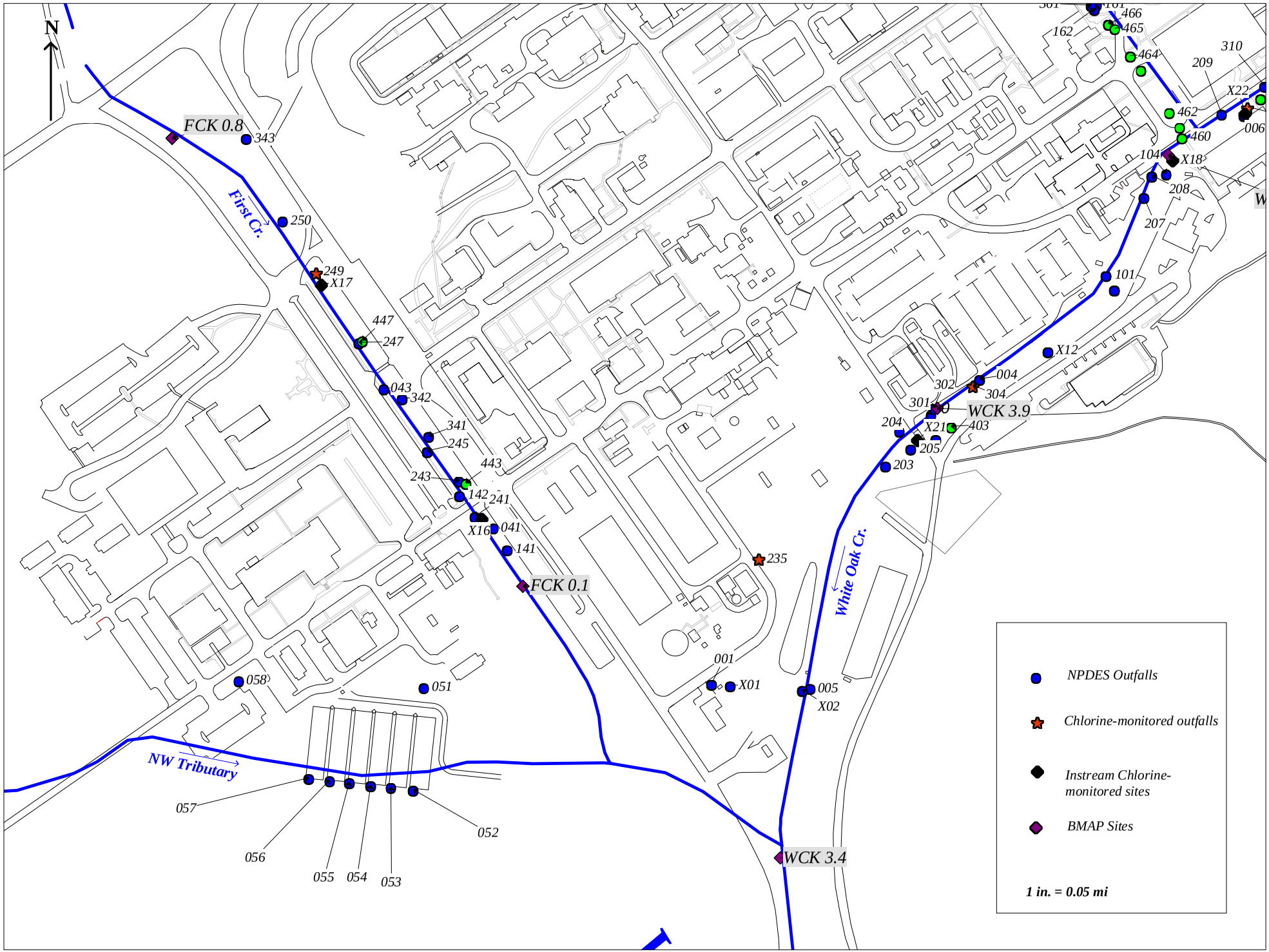

ORNL Outfalls and Monitoring Points

May, 2007

APPENDIX 2

PREVIOUS PERMIT LIMITS AND MONITORING REQUIREMENTS

OUTFALL XO1

PART I

A. **EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS**

OUTFALL X01 - SEWAGE TREATMENT PLANT (STP)

United States Department of Energy, Oak Ridge National Laboratory, is authorized to discharge treated wastewater from sources including but not limited to domestic sewage that are conducive to biological treatment through Outfall X01, the ORNL Sewage Treatment Plant, to White Oak Creek at mile 2.4 (kilometer 3.9). Discharge X01 shall be limited and monitored by permittee as specified below.

Parameter	Monthly Avg. amount Kg/day (lbs/day)	Daily Max. amount Kg/day (lbs/day)	Monthly Avg. conc. mg/L	Daily Max. conc. mg/L	Monitoring Frequency	Sample type
$CBOD_5$	8.7(19.2)	13.1(28.8)	10	15	3/week	composite
TSS	26.2(57.5)	30.2(66.3)	30	45	3/week	composite
Flow	Report maximum and monthly average				1/day	recorder
Ammonia (as N) Summer	2.84(6.26)	4.26(9.39)	2.5	3.75	3/week	composite
Ammonia (as N) Winter	5.66(13.14)	8.97(19.78)	5.25	7.9	3/week	composite
O&G	8.7(19.2)	13.1(28.8)	10	15	3/week	grab
D.O. [1]	N/A	N/A	[1] minimum 6 mg/L		3/week	grab
Total Residual Chlorine [2]	N/A	N/A	0.038	0.066	3/week	grab [2]
Fecal coliform (col./100 mL) [3]	N/A	N/A	200 [3]	1000	3/week	grab
Gross alpha	N/A	N/A	Report [4]	N/A	1/month	monthly composite
Gross beta	N/A	N/A	Report [4]	N/A	1/month	monthly composite
Cadmium, total	N/A	N/A	N/A	Report	1/month	composite
Mercury, total	N/A	N/A	Report	Report	2/month	composite
Cyanide, total	N/A	N/A	N/A	Report	1/month	grab
Silver, total	N/A	N/A	N/A	Report	1/month	composite
pH	pH shall be within the range 6.0 - 9.0				3/week	grab
LC_{50}	survival in 41.1% effluent				1/quarter	composite
NOEC	survival, reproduction, growth in 12.3% effluent				1/quarter	composite

- Sampling for flow shall be reported in million gallons per day (MGD). Where automated equipment is used to monitor flow, the flow may be totalized and reported for the period when someone does not physically check it. The results may be averaged for the days it was not physically checked and recorded as a daily flow. Such a totalized period that is averaged and reported cannot be greater than four days.
- Summer months are May through October; Winter months are November through April.
- STP influent monitoring shall be reported on the Monthly Operations Report rather than the Discharge Monitoring Report (DMR) and is not limited by this permit.
- A Grade III certified operator will be required for the Sewage Treatment Plant and a Grade I operator will be required for the Collection system.

[1] The dissolved oxygen limitation is a minimum concentration that must be present in the discharge.

[2] Sampled after mixing with discharges from Outfall 235 and before entry to the creek. Monitored only when chlorinated discharges present. Analyses for residual chlorine shall use a detection limit of 0.05 mg/L or the best that can be accomplished with a satisfactory confidence level using currently approved EPA methodology.

[3] Geometric Mean

[4] Reported in pCi/L

APPENDIX 2

PREVIOUS PERMIT LIMITS AND MONITORING REQUIREMENTS

OUTFALL XO2

OUTFALL X02 - COAL YARD RUNOFF TREATMENT FACILITY (CYRTF)

United States Department of Energy, Oak Ridge National Laboratory, is authorized to discharge treated wastewaters including coal pile runoff, water softener regenerant, ash system wastewater, and boiler blowdown through Outfall X02, the Coal Yard Runoff Treatment Facility, to White Oak Creek at mile 2.5 (kilometer 4.0). Discharge X02 shall be limited and monitored by the permittee as specified below.

Parameter	Monthly Avg. conc. mg/L	Daily Max. conc. mg/L	Monitoring Frequency	Sample type
Flow	Report maximum and monthly average		1/day	recorder
Total Suspended Solids	N/A	50	1/week	composite
Oil and Grease	10	15	1/week	grab
Gross alpha	Report [1]	N/A	1/month	monthly composite
Gross beta	Report [1]	N/A	1/month	monthly composite
Sulfate	N/A	Report	1/month	composite
Iron, total	1.0	1.0	2/month	composite
Antimony, total	N/A	Report	1/month	composite
Arsenic, total	0.006	0.012	2/month	composite
Cadmium, total	N/A	Report	1/month	composite
Chromium, total	N/A	Report	1/month	composite
Copper, total	0.07	0.11	2/month	composite
Lead, total	N/A	Report	1/month	composite
Mercury, total	N/A	Report	1/month	composite
Selenium, total	0.009	0.01	2/month	composite
Silver, total	N/A	0.008	2/month	composite
Zinc, total	0.87	0.95	2/month	composite
pH	within range 6.0 - 9.0		1/week	grab
LC_{50}	survival in 4.2% effluent		1/quarter	composite
NOEC	survival, reproduction, growth in 1.3% effluent		1/quarter	composite

- Sampling for flow shall be reported in million gallons per day (MGD). Where automated equipment is used to monitor flow, the flow may be totalized and reported for the period when someone does not physically check it. The results may be averaged for the days it was not physically checked and recorded as a daily flow. Such a totalized period that is averaged and reported cannot be greater than four days.
- The discharge of this treatment system is essentially a batch operation that goes into operation when rainfall creates enough runoff to warrant starting the system. Several days of treatment may occur during a week, or it may be that only one "batch" will be treated over several days depending on rainfall.
- Compliance with LC_{50} and NOEC will depend on whether sample can be collected as described in Permit Part III-C.

[1] Reported in units of pCi/l

APPENDIX 2

PREVIOUS PERMIT LIMITS AND MONITORING REQUIREMENTS

OUTFALL X12

OUTFALL X-12 - NON-RADIOLOGICAL WASTEWATER TREATMENT FACILITY (NRWTF)

United States Department of Energy, Oak Ridge National Laboratory, is authorized to discharge process wastewaters from ORNL activities treated for removal of metal and organic constituents through Outfall X-12, the Non-Radiological Wastewater Treatment Facility, to White Oak Creek at mile 2.6 (kilometer 4.2). Discharge X-12 shall be limited and monitored by the permittee as specified below.

Parameter	Monthly Avg. amount Kg/day (lbs/day)	Daily Max. amount Kg/day (lbs/day)	Monthly Avg. conc. mg/L	Daily Max. conc. mg/L	Monitoring Frequency	Sample type
Flow	Report maximum and monthly average				1/day	recorder
Temperature	N/A	N/A	N/A	30.5°C	1/week	grab
Total Suspended Solids	N/A	N/A	N/A	Report	1/quarter	composite
Total Toxic Organics	N/A	6.45 (14.20)	N/A	2.13	1/month	grab
Oil and Grease	30.3 (66.7)	45.4 (100)	10	15	1/week	grab
Gross alpha	N/A	N/A	Report [1]	N/A	1/month	monthly composite
Gross beta	N/A	N/A	Report [1]	N/A	1/month	monthly composite
Sulfate	N/A	N/A	N/A	Report	1/quarter	composite
Iron, total	N/A	N/A	N/A	Report	1/month	composite
Cyanide, total	1.97(4.33)	3.64(8.00)	0.008	0.046	1/quarter	grab
Arsenic, total	N/A	N/A	0.007	0.014	1/week	composite
Cadmium Total	0.79(1.73)	2.09(4.60)	0.008	0.034	1/week	composite
Chromium, total	5.18(11.40)	8.39(18.46)	0.22	0.44	1/week	composite
Copper, total	6.27(13.80)	10.24(22.53)	0.07	0.11	1/week	composite
Lead, total	1.3(2.87)	2.09(4.60)	0.028	0.69	1/week	composite
Mercury, total	N/A	N/A	0.000019	0.0003	1/week	composite
Nickel, total	7.21(15.86)	12.06(26.53)	0.87	3.98	1/week	composite
Selenium, total	N/A	N/A	0.01	0.01	1/week	composite
Silver, total	0.73(1.60)	1.3(2.87)	N/A	0.008	1/week	composite
Zinc, total	4.48(9.87)	7.91(17.40)	0.87	0.95	1/week	composite
pH	within the range 6.0 - 9.0				3/week	grab
LC_{50}	survival in 100% effluent				1/quarter	composite
NOEC	survival, reproduction, growth in 30.9% effluent				1/quarter	composite

- Sampling for flow shall be reported in million gallons per day (MGD). Where automated equipment is used to monitor flow, the flow may be totalized and reported for the period when someone does not physically check it. The results may be averaged for the days it was not physically checked and recorded as a daily flow. Such a totalized period that is averaged and reported cannot be greater than four days.

[1] Reported in units of pCi/L

APPENDIX 2

PREVIOUS PERMIT LIMITS AND MONITORING REQUIREMENTS

INSTREAM CHLORINE MONITORING POINTS

United States Department of Energy, Oak Ridge National Laboratory, shall monitor for total residual oxidant (chlorine and bromine analyzed and reported as chlorine) at the following instream monitoring locations. Monitoring points designated as Outfalls X16 and X17 in First Creek; monitoring points X18, X19, and X20 in Fifth Creek, and Points X21, X22, X23, X24, X25, and X26 in White Oak Creek.

These monitoring points shall be limited and monitored by the permittee as specified below:

Parameter	Monthly Avg. conc. mg/L	Daily Max. conc. mg/L	Monitoring Frequency	Sample type
Temperature	Report	Report	2/month	grab
pH	Report maximum and minimum		2/month	grab
Total Residual Oxidan[1]	0.011	0.019	2/month	grab

[1] Total Residual Oxidant (TRO) refers to residual chlorine/bromine measured as chlorine. Analyses for these monitoring points shall use a detection limit of 0.05 mg/L or the best that can be accomplished with a satisfactory confidence level using currently approved EPA methodology.

Monitoring shall be made during non-storm flow conditions where possible. A description of the flow during sampling conditions shall be kept with the sampling records.

APPENDIX 2

PREVIOUS PERMIT LIMITS AND MONITORING REQUIREMENTS

STEAM CONDENSATE OUTFALLS

United States Department of Energy, Oak Ridge National Laboratory, is authorized to discharge steam condensate and storm water through the following Outfalls: 031, 107, 220, 261, 262, 263, 310 & 311

These discharge points shall be limited and monitored by the permittee as specified below:

Outfalls 031, 107, 220, 310 & 311:

Parameter	Monthly Avg. conc. mg/L	Daily Max. conc. mg/L	Monitoring Frequency	Sample type
Temperature	N/A	Report	1/quarter	grab
Flow	Report estimated daily maximum value		1/quarter	estimate
pH	within the range 6.0 - 9.0		1/quarter	grab

Outfalls 261, 262, & 263:

Parameter	Monthly Avg. conc. mg/L	Daily Max. conc. mg/L	Monitoring Frequency	Sample type
Temperature	N/A	Report	1/quarter	grab
Flow	Report estimated daily maximum value		1/quarter	estimate
pH	within the range 6.5 - 8.5 [1]		1/quarter	grab

[1] The pH limits for these outfalls (261, 262, & 263) shall not apply to storm water monitoring.

Sampling for flow shall be reported in million gallons per day (MGD).

Outfalls 107, 261, and 262 are in the Storm Water Category I discharges for the storm water component of the discharges made through these points.

Outfalls 310 and 311 are in the Storm Water Category II discharges for the storm water component of the discharges made through these points.

Sampling for non-storm water discharges should be made when storm water flow is not present.

APPENDIX 2

PREVIOUS PERMIT LIMITS AND MONITORING REQUIREMENTS

OUTFALL 009, 080, 085

United States Department of Energy, Oak Ridge National Laboratory, is authorized to discharge groundwater from foundation drains through Outfalls 080, and 085 and pump water from a sump through Outfall 009.

Outfalls 009, 080 and 085 shall be limited and monitored by the permittee as specified below:

Outfall 009:

Parameter	Monthly Avg. conc. mg/L	Daily Max. conc. mg/L	Monitoring Frequency	Sample type
Flow	Report estimated daily maximum value		1/quarter	estimate
pH	within the range 6.0 - 9.0		1/quarter	grab

Outfalls 080, 085:

Parameter	Monthly Avg. conc. mg/L	Daily Max. conc. mg/L	Monitoring Frequency	Sample type
Flow	Report estimated daily maximum value		1/quarter	estimate
pH	within the range 6.5 - 8.5 [1]		1/quarter	grab

[1] The pH limits for these outfalls (080, 085) shall not apply to storm water monitoring.

Sampling for flow shall be reported in million gallons per day (MGD).

Sampling for non-storm water discharges should be made when storm water flow is not present.

APPENDIX 2

PREVIOUS PERMIT LIMITS AND MONITORING REQUIREMENTS

COOLING TOWER BLOWDOWN OUTFALLS

United States Department of Energy, Oak Ridge National Laboratory, is authorized to discharge cooling tower blowdown through the following Outfalls: 014, 215

These discharge points shall be limited and monitored by the permittee as specified below:

Parameter	Monthly Avg. conc. mg/L	Daily Max. conc. mg/L	Monitoring Frequency	Sample type
Temperature	N/A	Report	1/quarter	grab
Total Suspended Solids	N/A	Report	1/quarter	grab
Total Residual Oxidant [1]	N/A	Report	1/quarter	grab [1]
Flow	Report daily maximum value		1/quarter	estimate
pH	within the range 6.0 - 9.0		1/quarter	grab

[1] Total Residual Oxidant (TRO) refers to residual chlorine/bromine measured as chlorine. Analyses for these monitoring points shall use a detection limit of 0.05 mg/L or the best that can be accomplished with a satisfactory confidence level using currently approved EPA methodology.

Sampling for flow shall be reported in million gallons per day (MGD).

APPENDIX 2

PREVIOUS PERMIT LIMITS AND MONITORING REQUIREMENTS

OUTFALLS - STORM WATER CATEGORY I DISCHARGES

United States Department of Energy, Oak Ridge National Laboratory, is authorized to discharge storm water runoff, waters discharged according to a best management practices plan, groundwaters, steam condensate and water condensate through the following Category I Outfalls: 002, 004, 010, 021, 033, 041, 052, 053, 054, 055, 056, 057, 064, 070, 082, 084, 092, 102, 108, 109, 111, 112, 113, 115, 161, 164, 166, 168, 169, 170, 171, 181, 203, 206, 208, 209, 214, 221, 222, 224, 226, 246, 268, 269, 270, 292, 293, 294, 343, & 384.

Outfalls 107, 261, and 262 which are listed as steam condensate outfalls above are in the Storm Water Category I discharges for the storm water component of the discharges made through these points.

These discharge points shall be limited and monitored for dry weather flow as indicated below during non-storm water conditions by the permittee. If flow is found, the permittee shall monitor and report as specified below:

Outfalls 002, 004, 010, 021, 033, 092, 102, 108, 109, 111, 112, 113, 115, 203, 206, 208, 209, 214, 221, 222, 224, 226, 292, 293 & 294:

Parameter	Monthly Avg. conc. mg/L	Daily Max. conc. mg/L	Monitoring Frequency	Sample type
Flow	Report daily maximum value		1/six months	estimate
pH	within the range 6.0 - 9.0		1/six months	grab

Outfalls 041, 052, 053, 054, 055, 056, 057, 064, 070, 082, 084, 161, 164, 166, 168, 169, 170, 171, 181, 246, 268, 269, 270, 343, & 384:

Parameter	Monthly Avg. conc. mg/L	Daily Max. conc. mg/L	Monitoring Frequency	Sample type
Flow	Report daily maximum value		1/six months	estimate
pH	within the range 6.5 - 8.5 [1]		1/six months	grab

[1] The pH limits for these outfalls (041, 052, 053, 054, 055, 056, 057, 064, 070, 082, 084, 161, 164, 166, 168, 169, 170, 171, 181, 246, 268, 269, 270, 343, & 384) shall not apply to storm water monitoring.

Sampling for flow shall be reported in million gallons per day (MGD).

Category I storm water outfalls will have a storm water characterization performed on a schedule which would allow these outfalls to be characterized once every five years. These outfalls may be sub-grouped for the purposes of storm water characterization with other Storm Water Category I or II outfalls that are similar in storm water characteristics for the characterization.

Chlorinated water sources, if found, shall be monitored as described in the Chlorine Control Strategy. Monitoring for chlorine will be made at instream points X16 through X26.

APPENDIX 2

PREVIOUS PERMIT LIMITS AND MONITORING REQUIREMENTS

OUTFALLS - STORM WATER CATEGORY II DISCHARGES

United States Department of Energy, Oak Ridge National Laboratory, is authorized to discharge storm water runoff, waters discharged according to a best management practices plan, groundwaters, steam condensate and water condensate through the following Category II Outfalls: 005, 011, 012, 016, 043, 051, 058, 065, 086, 087, 091, 101, 104, 114, 141, 142, 143, 144, 162, 167, 205, 212, 216, 223, 230, 232, 233, 241, 242, 243, 245, 247, 250, 264, 266, 283, 284, 285, 286, 287, 288, 289, 290, 361, 362, 364, 365, & 366.

Outfalls 310 and 311 which are listed in the steam condensate outfalls above are in the Storm Water Category II discharges for the storm water component of the discharges made through these points.

These discharge points shall be inspected for dry weather flow during non-storm water conditions, and where flow occurs, shall be limited and monitored during non-storm conditions by the permittee as specified below:

Outfalls 005, 012, 016, 086, 087, 101, 104, 114, 205, 212, 216, 223, 230, 232, 285, 286, 287, 288, 289 & 290:

Parameter	Monthly Avg. conc. mg/L	Daily Max. conc. mg/L	Monitoring Frequency	Sample type
Total Residual Oxidant	see note below			
Flow	Report daily maximum value		1/six months	estimate
pH	within the range 6.0 - 9.0		1/six months	grab

Outfalls 011, 043, 051, 058, 065, 091, 141, 142, 143, 144, 162, 167, 233, 241, 242, 243, 245, 247, 250, 264, 266, 283, 284, 361, 362, 364, 365, & 366:

Parameter	Monthly Avg. conc. mg/L	Daily Max. conc. mg/L	Monitoring Frequency	Sample type
Total Residual Oxidant	see note below			
Flow	Report daily maximum value		1/six months	estimate
pH	within the range 6.5 - 8.5 [1]		1/six months	grab

[1] The pH limits for these outfalls (011, 043, 051, 058, 065, 091, 141, 142, 143, 144, 162, 167, 233, 241, 242, 243, 245, 247, 250, 264, 266, 283, 284, 361, 362, 364, 365, & 366) shall not apply to storm water monitoring.

Flows shall be reported in million gallons per day (MGD).

These storm water Category II outfalls will be characterized for the storm water discharge according to a schedule which will allow the discharges to be characterized once during a five year period. These outfalls may be sub-grouped for the purposes of storm water characterization with other Storm Water Category I or II outfalls that are similar in storm water characteristics for the characterization.

Total Residual Oxidant (TRO) refers to residual chlorine/bromine measured as chlorine. Chlorinated water sources, if found, shall be monitored as described in the Chlorine Control Strategy. Compliance monitoring for chlorine will be made at instream points (see Outfall X16 through X26). In conjunction with instream monitoring, sampling will be made of outfalls with chlorinated water as described in the strategy at the frequency described in the strategy.

APPENDIX 2

PREVIOUS PERMIT LIMITS AND MONITORING REQUIREMENTS

OUTFALLS IN STORM WATER CATEGORY III

United States Department of Energy, Oak Ridge National Laboratory, is authorized to discharge storm water runoff, waters discharged according to a best management practices plan, groundwaters, cooling tower blowdown, cooling waters, steam condensate and water condensate through the following Category III Outfalls: 001, 006, 165, 191, 207, 219, 227, 231, 234, 265, 282, 291, 301, 312, 363, 367, 381, 382 and 383

These discharge points shall be inspected for dry weather flow during non-storm water conditions, and where flow occurs, shall be limited and monitored during non-storm conditions by the permittee as specified below:

Outfalls 001, 006, 207, 219, 227, 231, 234, 301 & 312:

Parameter	Monthly Avg. conc. mg/L	Daily Max. conc. mg/L	Monitoring Frequency	Sample type
Total Residual Oxidant	see note below			
Flow	Report daily maximum value		1/quarter	estimate
pH	within the range 6.0 - 9.0		1/quarter	grab

Outfalls 165, 191, 265, 282, 291, 363, 367, 381, 382 & 383:

Parameter	Monthly Avg. conc. mg/L	Daily Max. conc. mg/L	Monitoring Frequency	Sample type
Total Residual Oxidant	see note below			
Flow	Report daily maximum value		1/quarter	estimate
pH	within the range 6.5 - 8.5 [1]		1/quarter	grab

[1] The pH limits for these outfalls (165, 191, 265, 282, 291, 363, 367, 381, 382 & 383) shall not apply to storm water monitoring.

Sampling for flow shall be reported in million gallons per day (MGD).

Total Residual Oxidant (TRO) refers to residual chlorine/bromine measured as chlorine. Chlorinated water sources shall be monitored as described in the Chlorine Control Strategy. Compliance monitoring for chlorine will be made at instream points (see Outfall X16 through X26). In conjunction with instream monitoring, sampling will be made of outfalls with chlorinated water as described in the strategy at the frequency described in the strategy.

Storm water for Category III outfalls will be characterized for the storm water discharge on a schedule that would allow characterization of the outfalls once every three years. Similar outfalls may be grouped for the purposes of the characterization. Grouping of Category III with Category IV outfalls may be made where appropriate.

APPENDIX 2

PREVIOUS PERMIT LIMITS AND MONITORING REQUIREMENTS

OUTFALLS - STORM WATER CATEGORY IV

United States Department of Energy, Oak Ridge National Laboratory, is authorized to discharge storm water runoff, waters discharged according to a best management practices plan, groundwaters, cooling tower blowdown, cooling waters, steam condensate and water condensate through the following Category IV Outfalls: 204, 210, 211, 217, 218, 235, 249, 267, 302, 304, 313, 314, 341, 342 & 368.

Outfalls 081 and 281 (listed in a separate table below) will be characterized as Storm Water Category IV discharges for the storm water portion of their discharges.

These discharge points shall be inspected for dry weather flow during non-storm water conditions, and where flow occurs, shall be limited and monitored during non-storm conditions by the permittee as specified below:

Outfalls 204, 210, 211, 217, 218, 235, 302, 304, 313 & 314:

Parameter	Monthly Avg. conc. mg/L	Daily Max. conc. mg/L	Monitoring Frequency	Sample type
Temperature	Report	Report	2/month	grab
Total Residual Oxidant	see note below			grab
Flow	Report daily maximum value		2/month	estimate
pH	within the range 6.0 - 9.0		2/month	grab

Outfalls 249, 267, 341, 342 & 368:

Parameter	Monthly Avg. conc. mg/L	Daily Max. conc. mg/L	Monitoring Frequency	Sample type
Temperature	Report	Report	2/month	grab
Total Residual Oxidant	see note below			grab
Flow	Report daily maximum value		2/month	estimate
pH	within the range 6.5 - 8.5 [1]		2/month	grab

[1] The pH limits for these outfalls (249, 267, 341, 342 & 368) shall not apply to storm water monitoring.

Sampling for flow shall be reported in million gallons per day (MGD).

Total Residual Oxidant (TRO) refers to residual chlorine/bromine measured as chlorine. Chlorinated water sources shall be monitored as described in the Chlorine Control Strategy. For the large chlorinated sources (Outfalls 210, 314, 249, 267 & 368) the monitoring shall be made at least once per week. Outfall 235 discharges will be sampled and reported via compliance monitoring made for Outfall X01. Compliance monitoring for chlorine will be made at instream points (see Outfall X16 through X26). In conjunction with instream monitoring, sampling will be made of outfalls with chlorinated water as described in the strategy at the frequency described in the strategy.

Storm water for Category IV outfalls will be characterized for the storm water discharge on a schedule that would allow characterization of the outfalls once every three years. Similar outfalls may be grouped for the purposes of the characterization. Grouping of Category IV with Category III outfalls may be made where appropriate.

APPENDIX 2

PREVIOUS PERMIT LIMITS AND MONITORING REQUIREMENTS

OUTFALLS 281, 081 - COOLING TOWER BLOWDOWN, COOLING WATER

United States Department of Energy, Oak Ridge National Laboratory, is authorized to discharge cooling waters and storm water runoff through Outfall 281 to an unnamed tributary of Melton Branch at mile 0.2 and through Outfall 081 which discharges at mile 0.3 of a different unnamed tributary to Melton Branch. Discharges 281 and 081 shall be limited and monitored by the permittee as specified below.

Parameter	Monthly Avg. conc. mg/L	Daily Max. conc. mg/L	Monitoring Frequency	Sample type
Total Residual Oxidant	0.011	0.019	2/month	grab
Flow	Report monthly average and maximum		2/month	estimate
pH	within the range 6.5 - 8.5 [1]		2/month	grab

[1] The pH limits for these outfalls (081, 281) shall not apply to storm water monitoring.

Sampling for flow shall be reported in million gallons per day (MGD).

Total Residual Oxidant (TRO) refers to residual chlorine/bromine measured as chlorine.

Outfalls 281 and 081 are in the Storm Water Category IV discharges for the storm water component of the discharges made through these points.

Sampling for non-storm water discharges should be made when storm water flow is not present.

APPENDIX 2

PREVIOUS PERMIT LIMITS AND MONITORING REQUIREMENTS

OUTFALL X-13, X14 and X15 - INSTREAM DATA COLLECTION

United States Department of Energy, Oak Ridge National Laboratory, shall monitor at in-stream monitoring points as described below:

1. at the weir just above the mouth of Melton Branch which is at mile 0.1 and is designated as Outfall X13,
2. at the weir on White Oak Creek, mile 1.6, which is designated as Outfall X14, and
3. at the White Oak Dam which is designated as Outfall X15 at stream mile 0.6.

Monitoring points designated as Outfalls X13, X14, and X15 shall be monitored as specified below.

Parameter	Monthly Avg. conc. mg/L	Daily Max. conc. mg/L	Monitoring Frequency	Sample type
Flow	Report maximum and monthly average		3/week	recorder

These monitoring points shall be included in the radiological monitoring plan.

- Sampling for flow shall be reported in million gallons per day (MGD). Where automated equipment is used to monitor flow, the flow may be totalized and reported for the period when someone does not physically check it. The results may be averaged for the days it was not physically checked and recorded as a daily flow. Such a totalized period that is averaged and reported cannot be greater than four days.
- Additional monitoring needed in support of the BMAP, radiological monitoring plans or other data gathering uses will be made if requested by the Division.

APPENDIX 2

PREVIOUS PERMIT LIMITS AND MONITORING REQUIREMENTS

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PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

United States Department of Energy (DOE) is authorized to discharge cooling tower blowdown and HVAC condensate water to a storm water detention pond which discharges to White Oak Creek at approximate stream mile 4.2 through Outfall 435. The pond emergency spillway, designated as Outfall 437, will discharge in large storm runoff situations to mile 0.6 of a tributary to White Oak Creek. For the purposes of this permit, sampling for Outfall 435 shall be considered representative of any concurrent emergency overflow discharges from Outfall 437 since both discharges are from the same small pond, and have a common source.

PERMIT LIMITS

OUTFALLS 435 and 437

EFFLUENT CHARACTERISTIC	EFFLUENT LIMITATIONS				MONITORING REQUIREMENTS	
	MONTHLY		DAILY			
	AVG. CONC. (mg/l)	AVG. AMNT. (lb/day)	MAX. CONC. (mg/l)	MAX. AMNT. (lb/day)	MSRMNT. FRQNCY.	SAMPLE TYPE
FLOW	Report *		Report (MGD) *		2/Week	Instantaneous
pH**	Range 6.5 - 9.0				2/Week	Grab **
CHLORINE, TOTAL RESIDUAL (TRC) ***	0.011	--	0.019	--	2/Week	Grab **

Note 1: Sampling for compliance determination for both Outfall 435 and 437 may be represented by sampling Outfall 435.

* Note 2: Flow shall be reported in Million Gallons per Day (MGD). Flows that exceed the measuring capacity of flow monitoring equipment from large storm event runoff shall be estimated. Permittee shall track whether overflow occurs at Outfall 437. See restriction on cooling tower blowdown in permit text below.

**Note 3: pH and TRC analyses shall be performed within fifteen (15) minutes of sample collection for grab samples. These parameters may be measured instantaneously rather than by grab sampling.

***Note 4: The acceptable methods for detection of total residual chlorine are any methods specified in 40 CFR Part 136 that reach a detection level allowing accurate evaluation of compliance with the permit limits. The required analytical quantitation level for TRC is 0.05 mg/L for compliance evaluations. A quantitation level other than 0.05 mg/L may be appropriate, but the permittee will not be approved to use it without supporting data for the wastewater in question. A request to use >0.05 mg/L or an alternate compliance evaluation detection level must be submitted to the regional TN Environmental Assistance Center and to the Enforcement and Compliance Section. Use of any detection level higher than the permit limits for evaluating compliance shall not be done without prior approval from the Division.

These discharges shall be limited and monitored by the permittee as specified below:

The permittee shall sample for compliance with permit limits at the end of pipe at Outfall 435. Sampling results at Outfall 435 may be used for Outfall 437 when water discharges through Outfall 437. The permittee shall emphasize sampling during dry weather conditions at

APPENDIX 3

HISTORICAL MONITORING AND INSPECTION

OUTFALL X01

			Individual Measurements				
Collection Method	Parameter	Units	Number of Measurements Detected	Number of Measurements	Minimum	Maximum	Average of Results
24HR	Aluminum	mg/L	0	1	0.2	0.2	0.200
24HR	Ammonia (summer)	mg/L	41	709	0.14	1.48	0.219
24HR	Ammonia (summer)	mg/L	0	1	0.2	0.2	0.200
24HR	Ammonia (winter)	mg/L	108	711	0.2	3.88	0.284
24HR	BARIUM,TOTAL (AS BA)	mg/L	1	1	0.0248	0.0248	0.025
24HR	Beryllium	mg/L	0	1	0.0001	0.0001	0.000
24HR	Bis(2-ethylhexyl)phthalate	mg/L	0	1	0.01	0.01	0.010
24HR	BORON,TOTAL (AS B)	mg/L	0	1	0.1	0.1	0.100
24HR	Bromodichloromethane	mg/L	0	1	0.005	0.005	0.005
24HR	CADMIUM, TOTAL	mg/L	8	110	0.0001	0.0005	0.000
24HR	Carbon disulfide	mg/L	0	1	0.005	0.005	0.005
24HR	CBOD	mg/L	17	1419	4.86	35	5.045
24HR	Chemical Oxygen Demand (COD)	mg/L	0	1	5	5	5.000
24HR	Chloroform	mg/L	1	1	0.001	0.001	0.001
24HR	COBALT,TOTAL (AS CO)	mg/L	1	1	0.0002	0.0002	0.000
GRAB	CYANIDE, TOTAL	mg/L	17	110	0.005	0.016	0.006
24HR	Dibromochloromethane	mg/L	0	1	0.005	0.005	0.005
24HR	Diethylphthalate	mg/L	0	1	0.01	0.01	0.010
GRAB	DISSOLVED OXYGEN	mg/L	1420	1420	6.4	12.9	8.8
GRAB	FECAL COLIFORM	col/100ml	727	1420	0	19000	61
	Flow	mgd	2288	2288	0.09181	0.7297	0.207
24HR	FLUORIDE,TOTAL (AS F)	mg/L	1	1	0.98	0.98	0.980
MNTHFC	GROSS ALPHA	pCi/L	10	109	-3.4	7.7	0.851
MNTHFC	GROSS BETA	pCi/L	109	109	120	4300	340
24HR	Kjeldahl Nitrogen	mg/L	1	1	0.534	0.534	0.534
24HR	LC50, CERIODAPHNIA DUBIA	%	36	36	41.1	100	51
24HR	LC50, FATHEAD MINNOW	%	36	36	21.6	100	50
24HR	MAGNESIUM,TOTAL (AS MG)	mg/L	1	1	10.9	10.9	10.900
24HR	MERCURY, TOTAL	mg/L	1	218	0.0002	0.00028	0.000
24HR	METHYLENE CHLORIDE	mg/L	0	1	0.005	0.005	0.005
24HR	Nitrate/Nitrite as Nitrogen	mg/L	1	1	9.67	9.67	9.670
24HR	NOEC, CERIODAPHNIA DUBIA	%	34	36	9.8	100	42
24HR	NOEC, FATHEAD MINNOW	%	36	36	12.3	100	51
GRAB	Oil&Grease	mg/L	8	1422	5.2	340	5.834
GRAB	PH	Std Unit	1420	1420	6.45	8.5	7
24HR	Phenols - Total Recoverable	mg/L	0	1	0.005	0.005	0.005
24HR	Phosphorus	mg/L	1	1	2.72	2.72	2.720
24HR	SILVER, TOTAL	mg/L	16	110	0.0001	0.00055	0.000
24HR	STRONTIUM,TOTAL (AS SR)	mg/L	1	1	0.116	0.116	0.116
24HR	SULFATE	mg/L	1	1	26	26	26.000
GRAB	TEMPERATURE	deg C	807	807	8.8	27.7	19
24HR	Total Organic Carbon	mg/L	1	1	2.14	2.14	2.140
GRAB	TOTAL RESIDUAL CHLORINE	mg/L	3	1423	0.05	0.4	0.050
24HR	TOTAL SUSPENDED SOLIDS	mg/L	480	1420	1	71	2.5
24HR	Total Xylene	mg/L	0	1	0.01	0.01	0.010
24HR	TRICHLOROETHYLENE	mg/L	0	1	0.005	0.005	0.005
24HR	VANADIUM,TOTAL (AS V)	mg/L	0	1	0.02	0.02	0.020

APPENDIX 3

HISTORICAL MONITORING AND INSPECTION

OUTFALL X02

					Individual Measurements			
Outfall or Location	Collection Method	Parameter	Units	Number of Meas'mts Detected	Number of Meas'mts	Minimum	Maximum	Average of Results
X02	24HR	Aluminum	mg/L	0	1	0.2	0.2	0.200
X02	24HR	AMMONIA (AS N)	mg/L	0	1	0.2	0.2	0.200
X02	24HR	ANTIMONY, TOTAL	mg/L	76	218	0.00017	0.0026	0.001
X02	24HR	ARSENIC, TOTAL	mg/L	147	218	0.001	0.0131	0.003
X02	24HR	BARIUM,TOTAL (AS BA)	mg/L	1	1	0.0575	0.0575	0.058
X02	24HR	Beryllium	mg/L	0	1	0.0001	0.0001	0.000
X02	24HR	Biochemical Oxygen Demand	mg/L	0	1	5	5	5.000
X02	24HR	Bis(2-ethylhexyl)phthalate	mg/L	0	1	0.01	0.01	0.010
X02	24HR	BORON,TOTAL (AS B)	mg/L	0	1	0.1	0.1	0.100
X02	24HR	CADMIUM, TOTAL	mg/L	44	218	0.0001	0.00371	0.001
X02	24HR	Chemical Oxygen Demand (C	mg/L	1	1	18	18	18.000
X02	24HR	Chloroform	mg/L	1	1	0.004	0.004	0.004
X02	24HR	CHROMIUM, TOTAL	mg/L	79	218	0.0005	0.00813	0.003
X02	24HR	COBALT,TOTAL (AS CO)	mg/L	1	1	0.001	0.001	0.001
X02	24HR	COPPER, TOTAL	mg/L	218	218	0.00224	0.158	0.013
X02	GRAB	CYANIDE, TOTAL	mg/L	0	1	0.005	0.005	0.005
X02	24HR	Dibromochloromethane	mg/L	0	1	0.005	0.005	0.005
X02	24HR	Di-n-butylphthalate	mg/L	0	1	0.01	0.01	0.010
X02	24HR	Di-n-octylphthlate	mg/L	0	1	0.01	0.01	0.010
X02	24HR	Ethylbenzene	ug/L	0	1	5	5	5.000
X02		Flow	mgd	2287	2287	0	0.43923	0.028
X02	24HR	FLUORIDE,TOTAL (AS F)	mg/L	1	1	3.4	3.4	3.400
X02	MNTHFC	GROSS ALPHA	pCi/L	2	109	-41	31	-0.174
X02	MNTHFC	GROSS BETA	pCi/L	82	109	-11	830	263.138
X02	24HR	IRON, TOTAL	mg/L	121	218	0.2	1.9	0.431
X02	24HR	Kjeldahl Nitrogen	mg/L	1	1	0.38	0.38	0.380
X02	24HR	LC50, CERIODAPHNIA DUBIA	%	37	37	4.2	100	22.324
X02	24HR	LC50, FATHEAD MINNOW	%	37	37	4.2	100	22.324
X02	24HR	LEAD, TOTAL	mg/L	150	218	0.0001	0.00854	0.000
X02	24HR	MAGNESIUM,TOTAL (AS MG)	mg/L	1	1	36.8	36.8	36.800
X02	24HR	MERCURY, TOTAL	mg/L	2	110	0.0002	0.00092	0.000
X02	24HR	NOEC, CERIODAPHNIA DUBIA	%	7	7	3.36	4.2	3.960
X02	24HR	NOEC, FATHEAD MINNOW	%	7	7	4.2	100	58.943
X02	GRAB	Oil&Grease	mg/L	2	473	5.3	7.8	5.640
X02	GRAB	PH	Std Unit	472	472	6.7	8.9	7.566
X02	24HR	Radium-226	pCi/L	0	1	-0.23	-0.23	-0.230
X02	24HR	SELENIUM, TOTAL	mg/L	115	218	0.0019	0.04	0.006
X02	24HR	SILVER, TOTAL	mg/L	9	218	0.0001	0.000686	0.000
X02	24HR	STRONTIUM,TOTAL (AS SR)	mg/L	1	1	0.561	0.561	0.561
X02	24HR	SULFATE	mg/L	110	110	150	3640	1548.055
X02	GRAB	TEMPERATURE	deg C	268	268	2.7	28.7	17.595
X02	24HR	Total Organic Carbon	mg/L	1	1	15.6	15.6	15.600
X02	24HR	Total Radium	pCi/L	1	1	2	2	2.000
X02	24HR	TOTAL SUSPENDED SOLIDS	mg/L	398	472	1	28.4	3.211
X02	24HR	Total Xylene	mg/L	0	1	0.01	0.01	0.010
X02	24HR	VANADIUM,TOTAL (AS V)	mg/L	0	1	0.02	0.02	0.020
X02	24HR	ZINC, TOTAL	mg/L	218	218	0.00604	0.159	0.022

APPENDIX 3

HISTORICAL MONITORING AND INSPECTION
OUTFALL X12

Collection Method	Parameter	Units	Number of Measurements Detected	Number of Measurements	Minimum	Maximum	Average of Results	Permit Limit
24HR	Aluminum	mg/L	0	1	0.2	0.2	0.200	
24HR	AMMONIA (AS N)	mg/L	0	1	0.2	0.2	0.200	
24HR	ARSENIC, TOTAL	mg/L	90	474	0.001	0.005	0.001	0.007
24HR	BARIUM,TOTAL (AS BA)	mg/L	1	1	0.0222	0.0222	0.022	
24HR	Beryllium	mg/L	0	1	0.0001	0.0001	0.000	
24HR	Biochemical Oxygen Demand (	mg/L	0	1	5	5	5.000	
24HR	Bis(2-ethylhexyl)phthalate	mg/L	0	1	0.01	0.01	0.010	
24HR	BORON,TOTAL (AS B)	mg/L	0	1	0.1	0.1	0.100	
24HR	Bromodichloromethane	mg/L	0	1	0.005	0.005	0.005	
24HR	CADMIUM, TOTAL	mg/L	87	474	0.0001	0.0052	0.000	0.008
24HR	Carbon disulfide	mg/L	0	1	0.005	0.005	0.005	
24HR	Chemical Oxygen Demand (COI	mg/L	0	1	5	5	5.000	
24HR	Chloroform	mg/L	0	1	0.005	0.005	0.005	
24HR	CHROMIUM, TOTAL	mg/L	148	474	0.0005	0.0063	0.002	0.220
24HR	COBALT,TOTAL (AS CO)	mg/L	1	1	0.0003	0.0003	0.000	
24HR	COPPER, TOTAL	mg/L	473	474	0.001	0.0333	0.006	0.070
GRAB	CYANIDE, TOTAL	mg/L	1	38	0.005	0.01	0.005	0.008
24HR	Dibromochloromethane	mg/L	0	1	0.005	0.005	0.005	
24HR	Diethylphthalate	mg/L	0	1	0.01	0.01	0.010	
24HR	Di-n-butylphthalate	mg/L	0	1	0.01	0.01	0.010	
24HR	Di-n-octylphthlate	mg/L	0	1	0.01	0.01	0.010	
24HR	Ethylbenzene	ug/L	0	1	5	5	5.000	
	Flow	mgd	2287	2287	0.03383	1.35481	0.503	
24HR	FLUORIDE,TOTAL (AS F)	mg/L	1	1	0.92	0.92	0.920	
MNTHFC	GROSS ALPHA	pCi/L	107	109	2.7	390	32.870	
MNTHFC	GROSS BETA	pCi/L	109	109	210	5200	981.743	
24HR	IRON, TOTAL	mg/L	14	468	0.005	0.785	0.254	
24HR	LC50, CERIODAPHNIA DUBIA	%	37	37	100	100	100.000	100.000
24HR	LC50, FATHEAD MINNOW	%	37	37	100	100	100.000	100.000
24HR	LEAD, TOTAL	mg/L	473	474	0.0001	0.0138	0.002	0.028
24HR	MAGNESIUM,TOTAL (AS MG)	mg/L	1	1	7.28	7.28	7.280	
24HR	Manganese	mg/L	0	1	0.0005	0.0005	0.001	
24HR	MERCURY, TOTAL	mg/L	8	474	0.0002	0.0017	0.00020	0.000019
24HR	METHYLENE CHLORIDE	mg/L	0	1	0.005	0.005	0.005	
24HR	NICKEL, TOTAL	mg/L	138	474	0.001	0.00524	0.001	0.870
24HR	Nitrate/Nitrite as Nitrogen	mg/L	1	1	1.94	1.94	1.940	
24HR	NOEC, CERIODAPHNIA DUBIA	%	37	37	80	100	95.676	30.900
24HR	NOEC, FATHEAD MINNOW	%	37	37	30.9	100	98.132	30.900
GRAB	Oil&Grease	mg/L	2	475	5.3	17.8	5.639	10.000
GRAB	PH	Std Unit	1420	1420	6.8	8.4	7.588	6 to 9
24HR	Phosphorus	mg/L	1	1	0.158	0.158	0.158	
24HR	Radium-226	pCi/L	0	1	0.26	0.26	0.260	
24HR	SELENIUM, TOTAL	mg/L	39	474	0.001	0.0115	0.002	0.010
24HR	SILVER, TOTAL	mg/L	123	474	0.0001	0.0009	0.000	
24HR	STRONTIUM,TOTAL (AS SR)	mg/L	1	1	0.109	0.109	0.109	
24HR	SULFATE	mg/L	38	38	78	301	159.895	
GRAB	TEMPERATURE	deg C	1420	1420	11.3	27.4	19.993	
24HR	Total Organic Carbon	mg/L	1	1	1.99	1.99	1.990	
24HR	Total Radium	pCi/L	0	1	0.81	0.81	0.810	
24HR	TOTAL SUSPENDED SOLIDS	mg/L	0	38	1	1	1.000	
GRAB	TOTAL TOXIC ORGANICS	mg/L	9	110	0	0.15	0.011	
24HR	Total Xylene	mg/L	0	1	0.01	0.01	0.010	
24HR	TRICHLOROETHYLENE	mg/L	0	1	0.005	0.005	0.005	
24HR	URANIUM,NATURAL, TOTAL	mg/L	1	1	0.00178	0.00178	0.002	
24HR	VANADIUM,TOTAL (AS V)	mg/L	0	1	0.02	0.02	0.020	
24HR	ZINC, TOTAL	mg/L	474	474	0.0059	0.107	0.029	0.870

APPENDIX 3

HISTORICAL MONITORING AND INSPECTION
INSTREAM MONITORING POINTS
CHLORINE CONTROL STRATEGY

					Individual Measurements			
Outfall or Location	Collection Method	Parameter	Units	Number of Meas'mts Detected	Number of Meas'mts	Minimum	Maximum	Average of Results
X16	GRAB	PH	Std Unit	218	218	7	8.4	7.80
X16	GRAB	TEMPERATURE	deg C	218	218	7.1	24.4	14.77
X16	GRAB	TOTAL RESIDUAL OXIDANT	mg/L	1	218	0.05	0.05	0.05
X17	GRAB	PH	Std Unit	218	218	7	8.2	7.71
X17	GRAB	TEMPERATURE	deg C	218	218	7	21.1	14.31
X17	GRAB	TOTAL RESIDUAL OXIDANT	mg/L	0	218	0.05	0.05	0.05
X18	GRAB	PH	Std Unit	218	218	7.1	8.4	7.79
X18	GRAB	TEMPERATURE	deg C	218	218	9.4	21.4	15.64
X18	GRAB	TOTAL RESIDUAL OXIDANT	mg/L	0	218	0.05	0.05	0.05
X19	GRAB	PH	Std Unit	218	218	7	8.3	7.81
X19	GRAB	TEMPERATURE	deg C	218	218	9.4	23.9	15.46
X19	GRAB	TOTAL RESIDUAL OXIDANT	mg/L	0	218	0.05	0.05	0.05
X20	GRAB	PH	Std Unit	218	218	7.1	8.3	7.77
X20	GRAB	TEMPERATURE	deg C	218	218	8.8	23.9	15.20
X20	GRAB	TOTAL RESIDUAL OXIDANT	mg/L	0	218	0.05	0.05	0.05
X21	GRAB	PH	Std Unit	218	218	7	8.4	7.77
X21	GRAB	TEMPERATURE	deg C	218	218	7.6	24.4	16.62
X21	GRAB	TOTAL RESIDUAL OXIDANT	mg/L	0	218	0.05	0.05	0.05
X22	GRAB	PH	Std Unit	218	218	7.1	8.3	7.72
X22	GRAB	TEMPERATURE	deg C	218	218	8	24.6	16.91
X22	GRAB	TOTAL RESIDUAL OXIDANT	mg/L	0	218	0.05	0.05	0.05
X23	GRAB	PH	Std Unit	218	218	7.1	8.5	7.80
X23	GRAB	TEMPERATURE	deg C	218	218	7.1	25.1	16.52
X23	GRAB	TOTAL RESIDUAL OXIDANT	mg/L	0	218	0.05	0.05	0.05
X24	GRAB	PH	Std Unit	218	218	7.3	8.5	7.82
X24	GRAB	TEMPERATURE	deg C	218	218	6.4	26.4	16.42
X24	GRAB	TOTAL RESIDUAL OXIDANT	mg/L	0	218	0.05	0.05	0.05
X25	GRAB	PH	Std Unit	218	218	7.1	8.4	7.79
X25	GRAB	TEMPERATURE	deg C	218	218	6.4	26	16.30
X25	GRAB	TOTAL RESIDUAL OXIDANT	mg/L	0	218	0.05	0.05	0.05
X26	GRAB	PH	Std Unit	218	218	7	8.2	7.68
X26	GRAB	TEMPERATURE	deg C	218	218	6.7	23.9	16.43
X26	GRAB	TOTAL RESIDUAL OXIDANT	mg/L	0	218	0.05	0.05	0.05

APPENDIX 3

HISTORICAL MONITORING AND INSPECTION

Summary of pH Results from Category Outfalls (February 3, 1997 through March 31, 2006)				
Outfall	Number of Meas'ments	Minimum	Maximum	Average
1	37	7.3	8.8	7.8
6	8	7.2	8.3	7.9
9	6	7.4	8.2	7.9
10	4	7.7	8	7.9
14	33	7.9	9	8.3
21	13	7.7	8.7	8.0
31	34	7	8.2	7.7
33	18	7.1	8.2	7.8
41	1	7.6	7.6	7.6
43	1	8.7	8.7	8.7
51	19	7.3	8.1	7.6
52	12	7.5	8.2	7.9
53	4	7.5	8.2	7.8
54	16	7.4	8.2	7.9
55	20	7.5	9.11	8.0
56	19	7.3	8.4	7.9
57	16	7.4	8.1	7.9
58	2	7.6	8.2	7.9
80	6	7.7	8	7.9
81	218	6.8	8.5	7.7
82	19	7.4	8.1	7.7
84	1	7.7	7.7	7.7
85	37	7	8.1	7.6
86	9	6.6	8	7.6
87	17	7.1	8.8	7.8
106	5	7.5	8	7.8
107	1	8.8	8.8	8.8
108	5	7.6	7.8	7.7
191	36	6.9	8.2	7.7
203	13	7.5	8.2	7.8
204	218	7	8.2	7.7
205	19	7.2	8	7.6
207	29	7.1	8.3	7.8
210	218	6.8	8.3	7.4
211	218	7	8.5	7.7
212	1	7.7	7.7	7.7
213	1	7.6	7.6	7.6
216	2	7.9	8.4	8.2
217	218	6.8	8.6	7.8
218	218	6.9	8.2	7.7
219	34	7.4	8.2	7.8
220	29	7	8.3	7.6
222	1	8.4	8.4	8.4
223	2	7.7	8.1	7.9
226	19	7.2	8.1	7.6
227	37	7.3	8.3	7.8
230	18	7.5	8.4	7.8
231	37	7.1	8.2	7.7

APPENDIX 3

HISTORICAL MONITORING AND INSPECTION

Summary of pH Results from Category Outfalls (February 3, 1997 through March 31, 2006)				
Outfall	Number of Meas'ments	Minimum	Maximum	Average
233	19	7.2	8.2	7.8
234	37	7.2	8.5	7.8
235	218	6.2	9.4	7.7
241	2	8	8.4	8.2
245	1	8.9	8.9	8.9
247	19	6.8	8.1	7.5
249	82	7.2	8.2	7.7
250	16	7.4	8.4	7.8
261	1	8	8	8.0
262	3	7.9	8.2	8.0
263	35	7	8.3	7.7
264	2	7.4	7.5	7.5
265	22	7.6	8.6	7.9
266	1	7.7	7.7	7.7
267	218	7	8.4	7.7
268	2	7.6	7.8	7.7
281	218	6.7	8.6	7.6
282	37	7.2	8.3	7.8
283	3	7.5	7.9	7.7
284	7	7.2	7.9	7.5
285	1	7.5	7.5	7.5
288	1	7.8	7.8	7.8
290	19	7.3	8.2	7.7
291	37	7.1	8.1	7.7
301	2	8.2	8.6	8.4
302	218	6.9	9.6	8.0
304	218	6.5	8.7	7.8
310	13	7	8.3	7.8
311	4	7.6	8.1	7.9
312	37	7.4	8.4	7.8
313	215	7.1	8.4	7.8
314	218	7	8.2	7.6
341	218	7	8.4	7.8
342	5	7.4	8	7.7
343	13	7.3	8.1	7.7
363	37	7.4	8.4	7.8
365	19	7.4	8.1	7.7
366	13	7.4	8	7.8
367	2	7.8	8.5	8.2
368	218	7.2	8.3	7.8
381	31	7.2	8	7.8
382	3	7.7	8.1	7.9
383	36	7.2	8.4	7.8
384	3	7.9	8	7.9
435	235	6.8	8.3	7.7
443	1	7.6	7.6	7.6
481	3	8.1	8.6	8.4

APPENDIX 4
WATER QUALITY BASED EFFLUENT CALCULATIONS

WATER QUALITY BASED EFFLUENT CALCULATIONS
OUTFALL X01

FACILITY USDOE - ORNL
PERMIT # TN0002941

Stream (7Q10)	Stream (30Q2)	Waste Flow	Ttl. Susp. Solids	Hardness (as CaCO3)	Stream Allocation
[MGD]	[MGD]	[MGD]	[mg/l]	[mg/l]	[%]
1.640	3.300	0.300	10	150	100

	1	2	3	4	5	6	7	8
	Stream Bckgrnd.	Fish/Aqua. Life Water Quality Criteria		Effluent Fraction	Fish & Aquatic Life Water Quality Criteria (7Q10)			
					In-Stream Allowable		Calc. Effluent Concentration	
EFFLUENT CHARACTERISTIC	Conc.**1**	Chronic	Acute	Dissolved	Chronic	Acute	Chronic	Acute
	[ug/l]	[ug/l]	[ug/l]	[Fraction]	[ug/l]	[ug/l]	[ug/l]	[ug/l]
Cadmium *	0.40	0.33	2.99	0.25	1.29	11.83	**6.16**	**74.30**
Copper *	14.70	12.66	19.69	0.35	36.43	56.65	**155.24**	**285.98**
Lead *	2.60	3.90	100.13	0.18	21.22	544.47	**122.99**	**3506.69**
Nickel *	10.00	73.29	659.84	0.43	169.52	1526.27	**1041.57**	**9815.21**
Silver *	0.15	NA	6.46	1.00	NA	6.46	**N/A**	**40.96**
Zinc *	154.00	166.57	165.22	0.29	578.39	573.69	**2898.37**	**2868.03**
Mercury, (T) **	0.15	0.91	1.69	1.00	0.91	1.69	**5.05**	**10.11**
Chromium (T) **	3.80	100.00	NA	1.00	100.00	N/A	**625.89**	**N/A**
Cyanide (T) **	2.60	5.20	22.00	1.00	5.20	22.00	**19.41**	**128.05**

9	10	11	12	13	14	
Human Health Water Quality Criteria (30Q2)						
In-Stream Criteria			Calc. Effluent Concentration			
Organisms	Water/Organisms	DWS	Organisms	Water/Organisms	DWS	
[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	
NA	NA	5.00	**NA**	**NA**	**55.60**	
NA	N/A	NA	**NA**	**NA**	**NA**	
NA	NA	5.00	**NA**	**NA**	**31.40**	
4600	610	100	**55090.00**	**7210.00**	**1090.00**	
NA	NA	NA	**NA**	**NA**	**NA**	
NA	NA	NA	**NA**	**NA**	**NA**	
0.05	0.05	2.00	**-1.04**	**-1.05**	**22.35**	***
NA	NA	100.00	**NA**	**NA**	**1158.20**	
220000	700	200	**2639971**	**8371.40**	**2371.40**	

* Denotes metals for which Fish & Aquatic Life Criteria are expressed as a function of total hardness. The Fish & Aquatic Life criteria for this metal are in the dissolved form at laboratory conditions.
The in-stream allowable criteria and calculated effluent concentrations are in the total recoverable form.
Hardness of background stream is assumed as 100 mg/l..

** The criteria for these parameters are in the total form.

*** Negative values for calculated mercury concentrations are due to background levels higher than WQ criterion.

Note 1: Background levels from DOE 2007 data near OF102, except cyanide = 1/2 WQ Criterion

NOTE: Water Quality criteria for stream use classifications other than Fish & Aquatic Life are based on the 30Q2 flow.

WATER QUALITY BASED EFFLUENT CALCULATIONS
OUTFALL X12

FACILITY: USDOE - ORNL
PERMIT #: TN0002941

Stream (7Q10)	Stream (30Q2)	Waste Flow	Ttl. Susp. Solids	Hardness as CaCO3	Stream Allocation
[MGD]	[MGD]	[MGD]	[mg/l]	[mg/l]	[%]
1.140	3.300	0.500	10	150	100

	1	2	3	4	5	6	7	8
	Stream	Fish/Aqua. Life		Effluent	Fish & Aquatic Life Water Quality Criteria (7Q10)			
	Bckgrnd.	Water Quality Criteria		Fraction	In-Stream Allowable		Calc. Effluent Concentration	
EFFLUENT	Conc.**1**	Chronic	Acute	Dissolved	Chronic	Acute	Chronic	Acute
CHARACTERISTIC	[ug/l]	[ug/l]	[ug/l]	[Fraction]	[ug/l]	[ug/l]	[ug/l]	[ug/l]
Cadmium *	0.40	0.33	2.99	0.25	1.29	11.83	**3.32**	**37.88**
Copper *	14.70	12.66	19.69	0.35	36.43	56.65	**85.98**	**152.30**
Lead *	2.60	3.90	100.13	0.18	21.22	544.47	**63.66**	**1779.93**
Nickel *	10.00	73.29	659.84	0.43	169.52	1526.27	**533.23**	**4983.36**
Silver *	0.15	NA	6.46	1.00	NA	6.46	**N/A**	**20.85**
Zinc *	154.00	166.57	165.22	0.29	578.39	573.69	**1545.99**	**1530.60**
Mercury, (T) **	0.15	0.91	1.69	1.00	0.91	1.69	**2.64**	**5.20**
Chromium (T) **	3.80	100.00	NA	1.00	100.00	N/A	**319.34**	**N/A**
Cyanide (T) **	2.60	5.20	22.00	1.00	5.20	22.00	**11.13**	**66.23**

9	10	11	12	13	14	
Human Health Water Quality Criteria (30Q2)						
In-Stream Criteria			Calc. Effluent Concentration			
Organism	ter/Organi	DWS	Organism	ter/Organis	DWS	
[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	[ug/l]	
NA	NA	5.00	**NA**	**NA**	**35.36**	
NA	N/A	NA	**NA**	**NA**	**NA**	
NA	NA	5.00	**NA**	**NA**	**20.84**	
4600	610	100	**34894**	**4570**	**694.00**	
NA	NA	NA	**NA**	**NA**	**NA**	
NA	NA	NA	**NA**	**NA**	**NA**	
0.05	0.05	2.00	**-0.60**	**-0.61**	**14.21**	***
NA	NA	100.00	**NA**	**NA**	**734.92**	
220000	700	200	**1671983**	**5303**	**1502.84**	

* Denotes metals for which Fish & Aquatic Life Criteria are expressed as a function of total hardness. The Fish & Aquatic Life criteria for this metal are in the dissolved form at laboratory conditions.

The in-stream allowable criteria and calculated effluent concentrations are in the total recoverable form.

*** Negative values for calculated mercury concentrations are due to background levels higher than WQ criterion.

** The criteria for these parameters are in the total form.

Note 1: Background levels from DOE 2007 data near OF102, except cyanide = 1/2 WQ Criterion

NOTE: Water Quality criteria for stream use classifications other than Fish & Aquatic Life are based on the 30Q2 flow.

LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	Meaning
AEC	Atomic Energy Commission
ASER	Annual Site Environmental Report for Oak Ridge Reservation
BMAP	Biological Monitoring and Abatement Program
BV	Bethel Valley
CBOD	Carbonaceous Biochemical Oxygen Demand
CCS	Chlorine Control Strategy
CEI	Compliance Evaluation Inspection
CERCLA	Comprehensive Environmental Remediation & Compensation Liability Act
CNMS	
COC	Constituent of Concern
DCG	Derived Concentration Guide
DO	Dissolved Oxygen
DOE	Department of Energy
DMR	Discharge Monitoring Report
ELG	Effluent Limitation Guideline
EM	Environmental Management
EMS	Environmental Management System
ETTP	East Tennessee Technology Park
HEM	Hexane Extractable Materials
HFIR	High Flux Isotope Reactor
HRE	Homogeneous Reactor Experiment
HRT	
IHT	
ISO	International Standards Organization
LEED	Leadership in Energy and Environmental Design
LLW	Low Level Wastes
LLLW	Low Level Liquid Waste
MEK	Melton Branch Kilometer
MGD (mgd)	Million Gallons per Day
MPF	
MV	Melton Valley
NOEC	No Observed Effect Concentration
NPDES	National Pollutant Discharge Elimination System
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
PCB	Polychlorinated Biphenyls
PWTC	Process Waste Treatment Complex
ROD	Record of Decision
SIC	Standard Industrial Classification
SNS	Spallation Neutron Source
SPWTF	Steam Plant Wasewater Treatment Facility
STP	Sewage Treatment Plant
SWPPP	Storm Water Pollution Prevention Plan
SWSA	Solid Waste Source Area
TMDL	Total Maximum Daily Load

LIST OF ACRONYMS AND ABBREVIATIONS - continued

TRO	Total Residual Oxidant
TRU	Transuranic
VOC	Volatile Organic Compound
WAG	Waste Area Group
WCK	White Oak Creek kilometer
WQBEL	Water Quality Based Effluent Limit
WQPP	Water Quality Protection Plan
WOC	White Oak Creek
WOCE	White Oak Creek Embayment
WOD	White Oak Dam
WOL	White Oak Lake
WOCHW	White Oak Creek Headwater Weir